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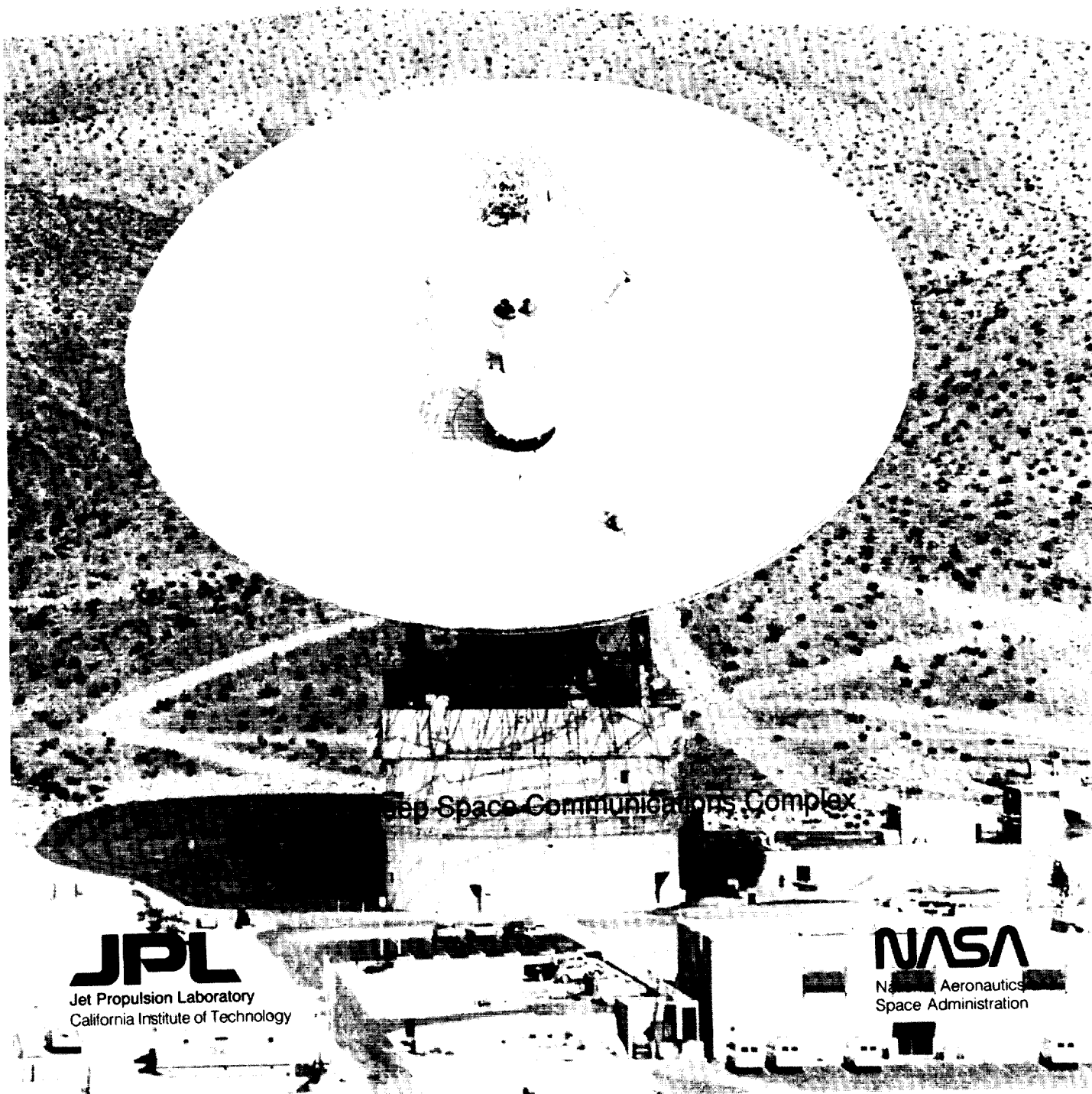
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# Environmental Projects: Volume 11

## Environmental Assessment: Addition to Operations Building, Mars Site



**JPL**  
Jet Propulsion Laboratory  
California Institute of Technology

**NASA**  
National Aeronautics  
Space Administration

# Environmental Projects: Volume 11

## Environmental Assessment: Addition to Operations Building, Mars Site

Goldstone Deep Space Communications Complex

## ABSTRACT

The Goldstone Deep Space Communications Complex (GDSCC), located in the Mojave Desert about 40 miles north of Barstow, California, and about 160 miles northeast of Pasadena, is part of the National Aeronautics and Space Administration's (NASA's) Deep Space Network (DSN), one of the world's largest and most sensitive scientific telecommunications and radio navigation networks. The Goldstone Complex is managed, technically directed, and operated for NASA by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology in Pasadena, California. A detailed description of the GDSCC is presented in Section II of this report.

The GDSCC includes five distinct operational areas named Echo Site, Venus Site, Mars Site, Apollo Site, and Mojave Base Site. Within each of the first four sites is a Deep Space Station (DSS) that consists of at least one parabolic dish antenna and support facilities. Although there are four DSN operational sites at the GDSCC, there now are six operational parabolic dish antennas because two antennas are located at the Mars Site and two are at the Apollo Site. The Mojave Base Site, while it is part of the GDSCC, is not part of the DSN.

At present, the Mars Site has 14 structures to support the activities of two operational DSN antennas: a 70-meter (230-ft) antenna known as the Mars Station (DSS-14) and a 34-meter (111.5-ft) antenna known as the Uranus Station (DSS-15). In conjunction with NASA, JPL has proposed to construct an addition to the Operations Control Building (G-86) at the Mars Site. The Operations Control Building houses Goldstone's Signal Processing Center (SPC-10) that contains various subsystems to remotely point and control the Echo DSS-12, the Mars DSS-14, and the Uranus DSS-15 antennas; to receive and process telemetry; to generate and transmit commands to spacecraft; and to produce navigational data for spacecraft.

This report is an Environmental Assessment of the proposed addition to building G-86 at the Mars site, which will provide space for new electronic equipment to consolidate the DSN support facilities from other GDSCC sites at the Mars Site, and will include a fifth telemetry and command group with its associated link monitor, control processor, and operator consoles. The addition of these facilities will increase the capability of the DSN to support future sophisticated NASA spacecraft missions such as the International Solar and Terrestrial Physics (ISTP) Program.

The planned construction of this building addition requires an Environmental Assessment (EA) document that records the existing environmental conditions at the Mars Site, that analyzes the environmental effects that possibly could be expected from the construction and use of the new building addition, and that recommends measures to be taken to mitigate any possibly deleterious environmental effects. In January, 1989, M. B. Gilbert Associates (MBGA), Long Beach, California, was retained by JPL to prepare the EA document.

This present report is an expanded JPL-version of the EA document submitted to JPL by MBGA in May 1989. The conclusion of the MBGA-prepared environmental assessment is that there would be no significant adverse effects on the environment due to the construction and use of the proposed new building addition at the Mars Site.

## GLOSSARY

BLM	U.S. Bureau of Land Management
CDFG	California Department of Fish and Game
CEQ	(Federal) Council on Environmental Quality
CFR	Code of Federal Regulations
CNDDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
DSCC	Deep Space Communications Complex
DSN	Deep Space Network
DSS	Deep Space Station
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service (see USFWS)
GDSCC	Goldstone Deep Space Communications Complex
HEF	High efficiency (antenna)
HVAC	Heating, ventilating and air-conditioning
ISTP	International Solar and Terrestrial Physics Program
JPL	Jet Propulsion Laboratory/California Institute Of Technology
MBGA	M. B. Gilbert Associates, Long Beach, California
MSL	Mean Sea Level
MTF	Microwave Test Facility
NAS	National Audubon Society
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration

NTC	National Training Center (U.S. Army)
RCN	Rural Conservation (area)
SEDAB	Southeast Desert Air Basin
SETI	Search for Extraterrestrial Intelligence
SPC-10	Signal Processing Center, GDSCC
STS	Space Transportation System (Space Shuttle)
TDS	Total dissolved solids
USC	United States Code
USCS	Unified Soil Classification System
USFWS	U.S. Fish and Wildlife Service (see FWS)
VLBI	Very Long Base Interferometry

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## SECTION I

### INTRODUCTION

The Goldstone Deep Space Communications Complex (GDSCC), located in the Mojave Desert about 40 miles north of Barstow, California, and about 160 miles northeast of Pasadena, is part of the National Aeronautics and Space Administration's (NASA's) Deep Space Network (DSN), one of the world's largest and most sensitive scientific telecommunications and radio navigation networks. The Goldstone Complex is managed, technically directed, and operated for NASA by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology in Pasadena, California. A detailed description of the GDSCC is presented in Section II of this report.

The GDSCC includes five distinct operational areas named Echo Site, Venus Site, Mars Site, Apollo Site, and Mojave Base Site. Within each of the first four sites is a Deep Space Station (DSS) of the DSN that consists of at least one parabolic dish antenna and support facilities. Although there are four operational DSN sites at the GDSCC, there now are six operational parabolic dish antennas because two antennas are located at the Mars Site and two are at the Apollo Site. The Mojave Base Site, while it is part of the GDSCC, is not part of the DSN.

#### A. PROPOSED CONSTRUCTION OF AN ADDITION TO BUILDING G-86 AT THE MARS SITE

At present, the Mars Site has 14 structures to support the activities of two operational DSN antennas: a 70-meter (230-ft) antenna known as Mars Station (DSS-14), and a 34-meter (111.5 ft) antenna known as Uranus station (DSS-15). The two-story Operations Control Building (G-86) at the Mars Site occupies 13,680 ft<sup>2</sup>. In conjunction with NASA, JPL has proposed to construct a two-story, 6,480-ft<sup>2</sup> addition to building G-86.

The Operations Control Building houses Goldstone's Signal Processing Center, known as SPC-10, that contains various subsystems to remotely point and control the Echo DSS-12, the Mars DSS-14, and the Uranus DSS-15 antennas; to receive and process telemetry; to generate and transmit commands to spacecraft; and to produce navigational data for spacecraft. At present, the SPC-10 does not remotely control the DSS-16 antenna at the Apollo Site, although it is planned to remotely control the antennas at the Apollo Site in 1992.

The proposed addition to building G-86 will provide space for new electronic equipment to consolidate the DSN support facilities from other GDSCC sites at the Mars Site, and will include a fifth telemetry and command group with its associated link monitor, control processor, and operator consoles. The addition of these facilities will increase the capability of the DSN to support future sophisticated NASA spacecraft missions such as the International Solar and Terrestrial Physics Program (ISTP).

#### B. DESCRIPTION OF THE PROPOSED BUILDING ADDITION AT THE MARS SITE

The proposed building addition to G-86 will be located directly east of the present building at the Mars Site, and will consist of a two-story modular

extension of reinforced masonry block construction with a plywood diaphragm roof. The dimensions of the extension will be 60 by 54 ft, with an approximate overall area of 6,480 ft<sup>2</sup>. Included in the new building-extension project will be a cable- and air-conditioning plenum; removable modular-type flooring; supporting heating, ventilation, and air-conditioning systems; power, lighting, and acoustical controls; and fire-suppression and protection equipment. Additional equipment to be housed and supported will include a fifth telemetry and command group with its associated link monitor, control processor, and control consoles.

### C. REQUIREMENT OF AN ENVIRONMENTAL ASSESSMENT

The proposed construction of the building addition at the Mars Site requires an Environmental Assessment (EA) document that records the existing environmental conditions at the Mars Site, analyzes the environmental effects that possibly could be expected from the construction and use of the addition to building G-86, and recommends measures that could be taken to mitigate any possibly deleterious environmental effects.

The need for an Environmental Assessment document had its origin in 1978, when the Federal Council on Environmental Quality (CEQ) issued regulations under 40 CFR Parts 1500-1508 to implement the procedural requirements of the National Environmental Policy Act (NEPA). Following this action, the National Aeronautics and Space Administration (NASA) procedures to implement NEPA were published in 14 CFR Subparts 1216.1 and 1216.3. The NASA procedures have been incorporated in the NASA Directives System as NMI 8800.7.

Thus, NASA installations planning qualifying projects must prepare an Environmental Assessment document (14 CFR 1216.304). As defined in 40 CFR Subpart 1508.9 - Preparation of Environmental Assessments, the purpose of the Environmental Assessment is to provide sufficient evidence and analysis to permit the determination whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

The EA report must be completed and a decision made as to whether an Environmental Impact Statement is required prior to beginning detailed project definition and planning (NASA, 1980). Evaluation of environmental impacts, therefore, must commence at the onset of project conception. In addition to assessing the probable impacts resulting from the proposed project, the EA must provide an evaluation of alternatives to the proposed project, including the alternative of "no action." While there is no requirement to select the alternative having the least environmental impact, the rationale for selecting the favored alternative must be provided.

In January 1989, M. B. Gilbert Associates (MBGA), Long Beach, California, was retained by JPL to prepare the EA document according to Section 102 of the National Environmental Policy Act (42 USC 4321); the Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR 1500-1508); NASA Policy on Environmental Control (14 CFR 1216.1); NASA Procedures for Implementing the National Environmental Policy Act (14 CFR 1216.3); and NASA Handbook 8800.11. The MBGA document serves as the Environmental Assessment for the proposed 6,480-ft<sup>2</sup> extension to building G-86 at the Mars Site at the GDSCC.

#### D. SUMMARY OF THE ENVIRONMENTAL ASSESSMENT

The environmental consequences of the proposed construction of a 6,480-ft<sup>2</sup>, two-story extension to building G-86 at the Mars Site will be minimal. The construction and use of the proposed addition will not result in any significant impacts to the natural environment (geology, seismic conditions, soils, water resources, floodplains, biotic resources, or air quality). Similarly, there will be minimal human environmental impacts (socioeconomics, traffic and circulation, noise, cultural resources, solid and hazardous wastes, toxic substances and pesticides, and aesthetics), because the proposed addition will be a minor expansion of an existing operations facility at an existing site.

#### E. CONCLUSIONS OF THE ENVIRONMENTAL ASSESSMENT

The EA, concerning the construction and operation of a proposed 6,480-ft<sup>2</sup> extension to building G-86 at the Mars Site at the GDSCC, has analyzed many areas of possible environmental concern.

Key issues associated with potential impacts were identified during the building-addition's planning stage. The conclusion of the EA analysis is that the proposed action would cause no significant adverse impacts to the natural or human environment, and a Finding of No Significant Impact (FONSI) is recommended in accordance with NASA procedures in 40 CFR 1216.306(b).

## SECTION II

### THE GOLDSTONE DEEP SPACE COMMUNICATIONS COMPLEX (GDSCC)

#### A. LOCATION OF THE GDSCC

The Goldstone Deep Space Communications Complex (GDSCC) is located in southern California in a natural, bowl-shaped depression in the Mojave Desert, in San Bernardino County about 40 miles north of Barstow, California, and about 160 miles northeast of Pasadena, California, where the Jet Propulsion Laboratory (JPL) is located.

As indicated in Section I, the GDSCC is part of the National Aeronautics and Space Administration's (NASA) Deep Space Network (DSN), one of the world's largest and most sensitive scientific telecommunications and radio navigation networks. The Goldstone Complex is managed, technically directed, and operated for NASA by the Jet Propulsion Laboratory of the California Institute of Technology in Pasadena, California.

The 52-mi<sup>2</sup> Goldstone Complex lies within the western part of the Fort Irwin Military Reservation (Figure 1). A Use Permit for the land was granted to NASA by the U.S. Army. The Complex is bordered by the Fort Irwin Military Reservation on the north, east and southeast; the China Lake U.S. Naval Weapons Center on the northwest; and state and Federal lands managed by the U.S. Bureau of Land Management (BLM) on the south.

#### B. FUNCTIONS OF THE GDSCC

After the Space Act of 1958 had accelerated U.S. plans and programs for space exploration, JPL initiated construction work at Goldstone to build the first tracking station of what is now known as the Deep Space Network (DSN). Thus, for more than three decades, the primary purpose of the DSN has been and continues today to support the tracking of both manned and unmanned spacecraft missions and to provide instrumentation for radio and radar astronomy in the exploration of the solar system and the universe.

Over the years, the DSN has become a world leader in the development of low-noise receivers; tracking, telemetry, and command systems; digital signal processing; and deep space radio navigation.

The basic responsibilities of the DSN are to receive telemetry signals from spacecraft, to transmit commands that control the various spacecraft operations, and to generate the radio navigation data used to locate and guide the spacecraft to its destination.

Because of its advanced technical ability to perform the above services, the DSN also is able to carry out the following functions: flight radio-science, radio and radar astronomy, very long baseline interferometry (VLBI), precise measurement of minute earth movements (geodynamics), and participation in the NASA Search for Extraterrestrial Intelligence (SETI).

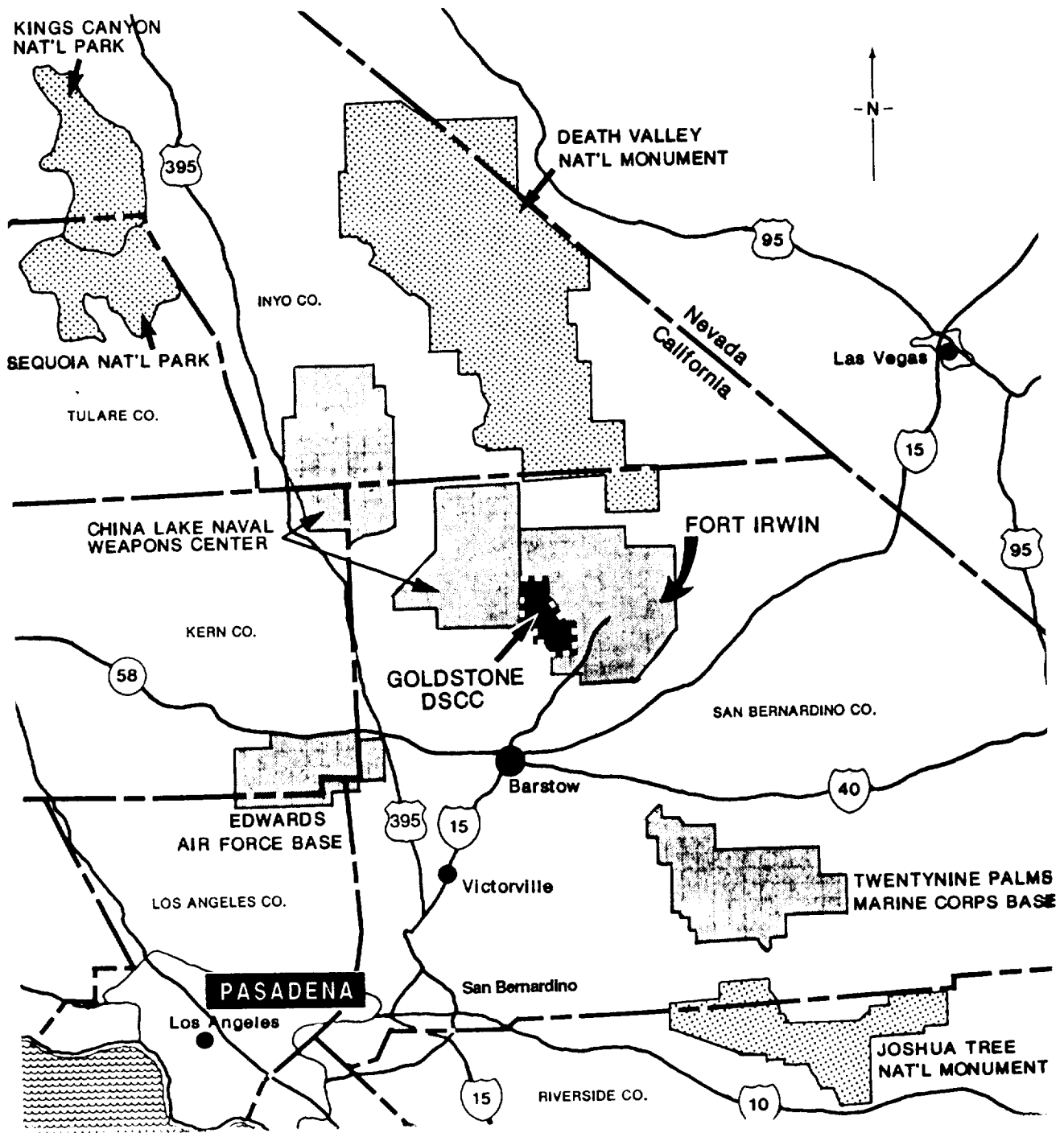


Figure 1. Geographic Relationship of the Goldstone Deep Space Communications Complex to JPL in Pasadena

Goldstone also is a research and development center to extend the communication range and to increase the data acquisition capabilities of the DSN. It serves as a proving ground for new operational techniques. Prototypes of all new equipment are thoroughly tested at Goldstone before they are duplicated for installation at overseas stations (see Section II, C below).

#### C. FACILITIES AT THE GDSCC

The GDSCC is a self-sufficient, working community with its own roads, airstrip, cafeteria, electrical power, and telephone systems and is equipped to conduct all necessary maintenance, repairs, and domestic support services. Facilities at the GDSCC include about 100 buildings and structures that were constructed during a 30-year period from the 1950s through the 1980s. The construction of additional buildings and structures continues today as the GDSCC increases its activities and operations.

Goldstone is one of three Deep Space Communications Complexes (DSCCs) operated by NASA that are located on three continents: at Goldstone in southern California's Mojave Desert; in Spain, about 60 kilometers (37 miles) west of Madrid at Robledo de Chavela; and near the Tidbinbilla Nature Reserve, in Australia, about 40 kilometers (25 miles) southwest of Canberra. Because these three DSCCs are approximately 120 degrees apart in longitude, a spacecraft always is in view of one of the DSCCs as the Earth rotates on its axis (Figure 2).

Activities at the GDSCC operate in support of six parabolic dish antennas, at five sites called Deep Space Stations (DSSs): Four sites are operational, while one is devoted to research and development (R&D) activities. There also are four, similar, operational DSSs in Spain and in Australia. Thus, the NASA DSN consists of a worldwide network of 12 operational DSSs. In addition, a seventh smaller parabolic dish antenna at the Venus Site now is unused, while an eighth parabolic dish antenna at Goldstone is operated by the National Oceanic and Atmospheric Administration (NOAA).

A Network Operations Control Center (NOCC), located at JPL in Pasadena, controls and monitors the DSN. A Ground Communications Facility (GCF) of the DSN operates to link together the NOCC at JPL with the three DSCCs at Goldstone, Spain, and Australia.

Total NASA/JPL facilities at the GDSCC (Figure 3) include the six DSN parabolic dish antennas, an airport, a microwave test facility, miscellaneous support buildings, and a remote support facility in Barstow located about 40 miles south of the GDSCC. The GDSCC support staff consists of about 260 personnel on-site and at the Barstow facility. Table 1 summarizes the major facilities, buildings (number and square footage), and antennas (construction date and size). Three sites within the GDSCC have antennas (referred to as stations) devoted to NASA DSN operations: Echo Station, Mars Station, Uranus Station, and two antennas at Apollo Station. Two other sites have antennas devoted to research and development: Venus, operated by the GDSCC, and Mojave, operated by the National Oceanic and Atmospheric Administration.

A 26-meter (85-ft) antenna, located at the Pioneer Site, was deactivated in 1981. In 1985, the Pioneer antenna (DSS-11) was designated a National Historic Landmark by the U.S. Department of Interior, and the Pioneer Site was returned to the U.S. Army. Each of the Goldstone sites is briefly described below.



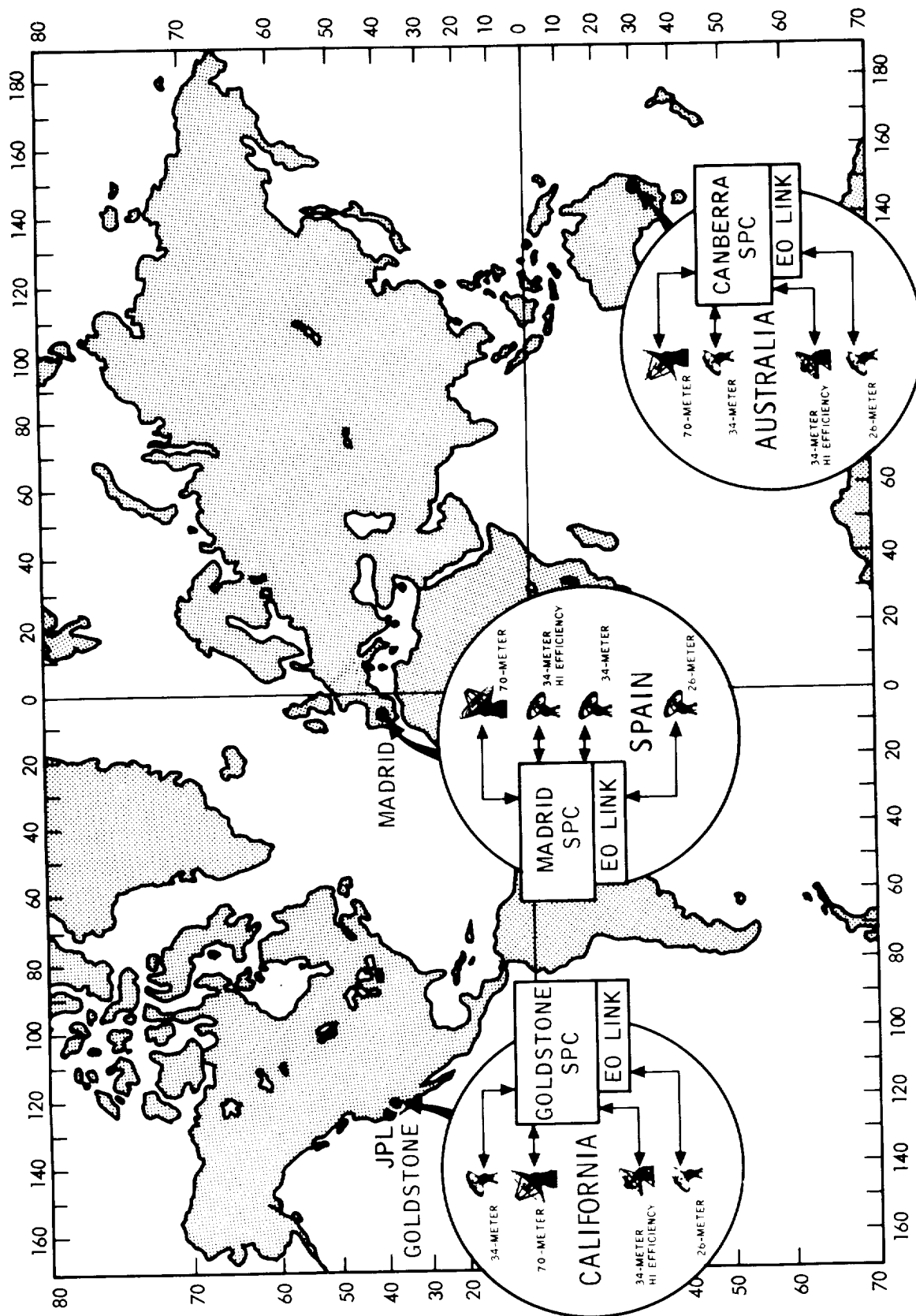


Figure 2. The Three-Continent NASA Deep Space Network as It Exists in 1990

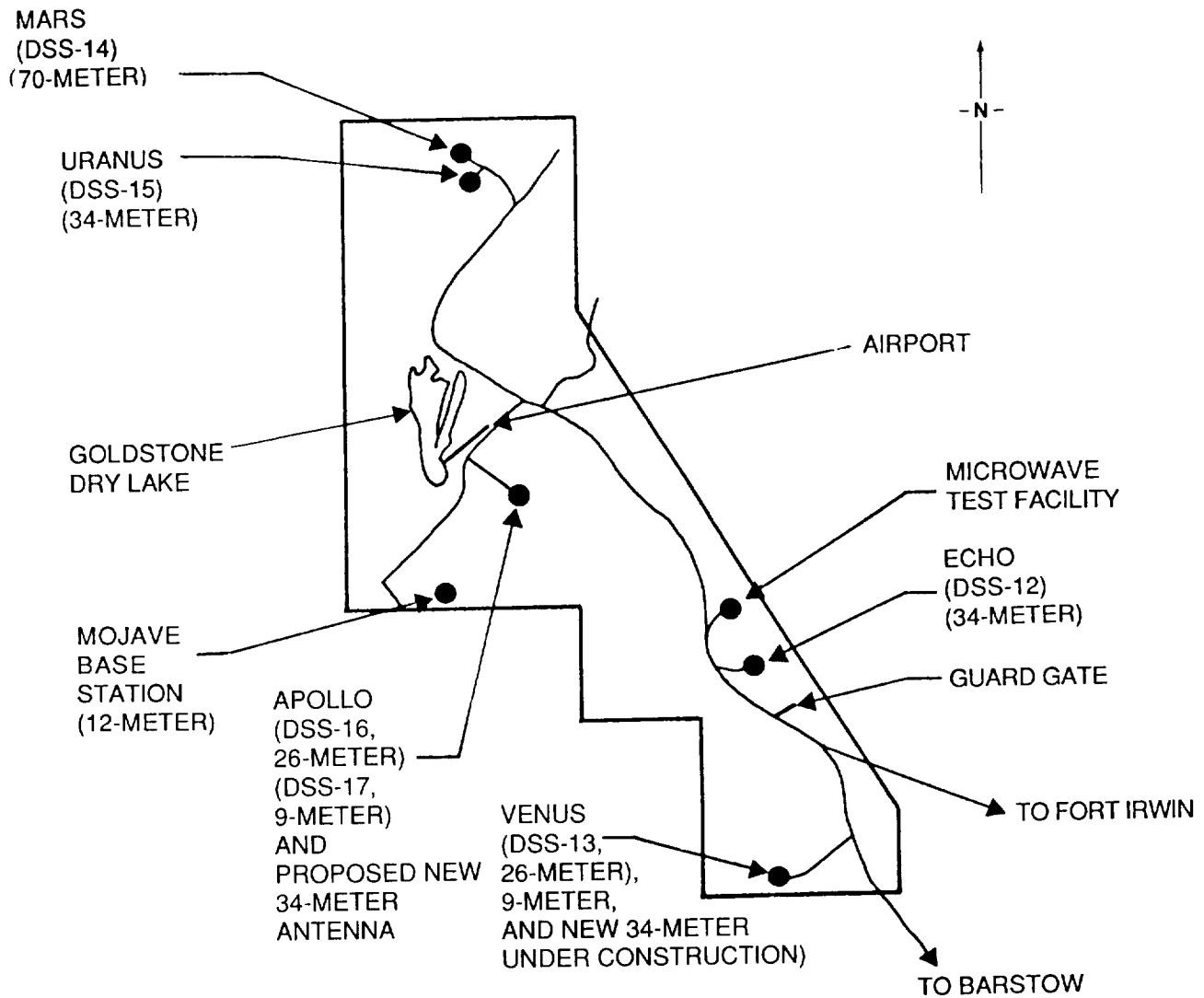


Figure 3. Schematic Map of the Goldstone DSCC Showing Locations of the Five NASA Deep Space Stations (DSSs) and the Mojave Base Station Operated by NOAA

Table 1. Major Facilities at the GDSCC

Site	Station Number	Buildings		Antennas	
		Number	(ft <sup>2</sup> )	Date of Construction	Size (Meters)
Echo Site	DSS-12	25	79,208	1961 <sup>a</sup>	34 <sup>b</sup>
Venus Site	DSS-13	15	12,589 <sup>c</sup>	1962 <sup>d</sup>	26
	(present antenna)				9
	DSS-13 (now under construction)				34
Mars Site	DSS-14	14	41,754	1966	70 <sup>e</sup>
	DSS-15			1984	34
Apollo Site	DSS-16	21	43,978	1965 <sup>f</sup>	26
	DSS-17				9
	DSS-18 (proposed)				34
Mojave Site		5	11,850	1964	12 <sup>g</sup>
Airport <sup>h</sup>		3	4,848	1963/1970	--
Microwave Test Facility	MTF	1	2,880	1963	--
Miscellaneous	--	3	1,430	--	--
Barstow Facility <sup>i</sup>		1	28,343	--	--

<sup>a</sup>The original antenna, built in 1959, was moved to the Venus Site in 1962. A 26-meter antenna, built in 1961, was extended to 34 meters in 1978.

<sup>b</sup>This antenna is to be dismantled and removed after the DSS-18 antenna at the Apollo Site becomes operational in 1993.

<sup>c</sup>This square footage does not include the two newly constructed facilities for Hazardous Materials Storage and for Acid-Wash.

<sup>d</sup>This antenna was constructed at the Echo Site in 1959 and moved to the Venus Site in 1962.

<sup>e</sup>Originally constructed as a 64-meter antenna in 1966, this antenna was enlarged to 70 meters in 1988.

<sup>f</sup>This antenna originally was constructed for the NASA Goddard Space Tracking and Data Network. JPL/GDSCC/DSN operation of the antenna began in October 1984.

<sup>g</sup>This antenna is operated by the National Oceanic and Atmospheric Administration (NOAA).

<sup>h</sup>The airport is located at the Goldstone Dry Lake.

<sup>i</sup>This site, a leased facility, is located in Barstow, California, about 40 miles southwest of the GDSCC.

Source: Directory of Goldstone DSCC Buildings and Supporting Facilities (Gold Book, Document 890-165, JPL internal document), Jet Propulsion Laboratory and National Aeronautics and Space Administration, Revised Edition, October 1989.

## D. ANTENNA STATIONS AT THE GDSCC

### 1. Echo Site (DSS-12)

The Echo Site, as the administration center and operations headquarters of the GDSCC, is the most extensively developed site on the complex. It has one 34-meter (111.5-ft) antenna and 24 support buildings, with a combined area of 79,208 ft<sup>2</sup>. Support buildings include administration and engineering offices, cafeteria, dormitory, transportation and maintenance facilities, storage areas, and warehouses. The Echo Station originally was built in 1959 as a 26-meter (85-ft) antenna. The antenna was first used in 1960 to support the Echo Project, an experiment to transmit voice communications coast-to-coast by bouncing radio signals off the reflective Mylar surface of a passive balloon-type satellite. In 1962, this original 26-meter antenna was moved to the Venus Site. In anticipation of this move, a newer 26-meter antenna had been built at the Echo Site in 1961. In 1978, this antenna was enlarged to 34 meters (111.5 ft). The present antenna is approximately 35 meters (113 ft) high and weighs about 270,000 kilograms (300 tons). In 1993, it is to be replaced by the new DSS-18 34-meter antenna that is proposed to be constructed at the Apollo Site.

### 2. Venus Site (DSS-13)

The Venus Site consists of two antennas: a 26-meter (85-ft) antenna and a 9-meter (29.5-ft) antenna. The smaller antenna is no longer used. There are 15 buildings having a combined area of 12,589 ft<sup>2</sup>. The support buildings provide space for operations control, laboratories, offices, security, workshops, warehouses, and mechanical equipment. The 26-meter antenna, which was originally located at the Echo Site, was moved to the Venus Site in 1962. The antenna was used for a radar astronomy study of the planet Venus. Currently, its primary functions are research and development and performance- and reliability-testing of high-power radio-frequency transmitters and new systems and equipment prior to their introduction into the Deep Space Network.

A new 34-meter (111.5-ft) antenna is now under construction to replace the 26-meter antenna. The new DSS-13 antenna is planned to begin research and development activities in 1991. An Environmental Assessment concerning this new antenna is the subject of JPL Publication 87-4, Volume 6, Environmental Assessment: New 34-Meter Antenna at Venus Site (June 15, 1988).

### 3. Mars Site (DSS-14 and DSS-15)

The Mars Site consists of two antennas and 14 buildings, with a combined area of 41,754 ft<sup>2</sup>. The support buildings provide facilities for operations control, offices, training, mechanical equipment, storage, and security. In May 1989, M. B. Gilbert Associates (MBGA), Long Beach, California, submitted an Environmental Assessment to JPL concerning the construction work needed for a proposed building extension to the Operations Building (Bldg. G-86) at the Mars Site.

This present report, JPL Publication 87-4, Volume 11, Environmental Assessment: Addition to Operations Building, Mars Site (February 15, 1990), is an expanded JPL-version of the EA document submitted to JPL by MBGA in May 1989.

The Mars Station Antenna (DSS-14), at 70 meters (230 ft) in diameter, is one of the larger antennas of its kind in the world (see Front Cover). The antenna, which was constructed as a 64-meter antenna in 1966 and enlarged to 70 meters in 1988, is 7.25 times more powerful and sensitive than a 26-meter antenna, extending the range of deep space communications by 2.7 times. It can maintain communications with spacecraft to the edge of the solar system. Standing more than 235 ft high, this antenna is one of the more striking features to be seen in the GDSCC geographic area. The 70-meter antenna was used in August 1989 for the Voyager 2 spacecraft's encounter with the planet Neptune. The latter is located at a distance of 4.5 billion kilometers (2.8 billion miles) from Earth.

The Uranus Station Antenna (DSS-15) is a 34-meter, high-efficiency (HEF), precision-shaped antenna, located approximately 1,600 ft southeast of the Mars Station Antenna. Built in 1984, this latest antenna at the GDSCC first was used in January 1986 to support the encounter of the Voyager 2 spacecraft with the planet Uranus, located at a distance of more than 3 billion kilometers (1.8 billion miles) from Earth. The new, proposed 34-meter, precision-shaped antennas, now under construction at the Venus Site (see above) and proposed for the Apollo Site (see below), are similar in size and structure to this Uranus Station antenna.

#### 4. Apollo Site (DSS-16 and DSS-17)

The Apollo Site has a 26-meter (85-ft) antenna (DSS-16), a 9-meter (29.5-ft) antenna (DSS-17), and 21 buildings, with a combined total area of 43,978 ft<sup>2</sup>. The buildings provide space for operations, equipment, storage, and warehousing. The 26-meter antenna originally was constructed in 1965 by NASA's Goddard Space Tracking and Data Network to support the manned Apollo missions to the moon. Operation of this antenna under JPL management began in October 1984. Both the 26-meter and the 9-meter antennas now are used to support the missions of the Space Shuttle (STS) and satellites in both low and high Earth orbits. In May 1989, M. B. Gilbert Associates, Long Beach, California, submitted an Environmental Assessment to JPL concerning the construction work needed for a proposed new 34-meter (111.5-ft) antenna (DSS-18) at the Apollo Site. The details of this Environmental Assessment are described in JPL Publication 87-4, Volume 10, Environmental Assessment: New 34-Meter Antenna at Apollo Site (January 15, 1990).

#### 5. Mojave Base Site (NOAA Antenna)

The Mojave Base Site has one antenna and five buildings, with a combined area of 11,850 ft<sup>2</sup>. At one time, these buildings provided support facilities for operations, equipment, and maintenance. Except for the NOAA operations buildings, however, these buildings now are not in use.

The Mojave Base Site Antenna is a 12-meter (40-ft) antenna operated by the National Oceanic and Atmospheric Administration (NOAA). The antenna is involved in several programs including monitoring of shifts in the Earth's tectonic plates, monitoring weather changes, and retrieving information from very low-orbiting Earth satellites.

## E. SUPPORT FACILITIES AT THE GDSCC

### 1. Goldstone Dry Lake Airport

The airport consists of an approximately 6,000- by 100-ft paved runway. There are two buildings at the airport site, neither of which is presently in use. An open hangar is used to provide shelter for a single aircraft. For its personnel, NASA operates three scheduled shuttle flights per week to the GDSCC that originate from the Burbank-Glendale-Pasadena Airport. In addition, the Goldstone airport is used infrequently by administrative Army flights. Both NASA and the U.S. Army use propeller-driven aircraft.

### 2. Microwave Test Facility and Fire-Training Area

The Microwave Test Facility (MTF) and Fire-Training Area consist of a single building of 2,880 ft<sup>2</sup> along with areas identified for fire fighting. The MTF is used for research and development testing of antenna microwave equipment. Fire training includes procedures for the quenching of fires.

### 3. Miscellaneous Buildings in the GDSCC Area

Three buildings and structures at the GDSCC that fall into this category include the main gatehouse, pump house, and radio spectrum monitor. The total area of these three buildings/structures is 1,430 ft<sup>2</sup>.

### 4. Off-Site Facility at Barstow, California

In addition to the above-mentioned on-site facilities, the GDSCC leases an office and warehouse support facility in the nearby city of Barstow. The facility is a single-story, 28,343-ft<sup>2</sup> structure located at 850 Main Street.

## F. NON-STRUCTURAL SUPPORT FACILITIES AT THE GDSCC

### 1. Transportation Network

The major roadways in the area are shown in Figure 4. The only surface public transportation route to the GDSCC is by the Fort Irwin Road that leads to Fort Irwin. The NASA Road cutoff from Fort Irwin Road leads into the GDSCC. NASA Road merges with Goldstone Road, which is the only north-south paved access road within the complex. Both NASA and Goldstone Roads are paved two-lane roads and are maintained by the Ft. Irwin Post Engineer. Two-lane paved access roads also lead to each of the sites and major facilities.

### 2. Utilities and Services

The Southern California Edison Company provides electricity for the Goldstone Complex. The GDSCC provides its own backup diesel-engine generators for operations during emergencies and to ensure continuity of electrical service

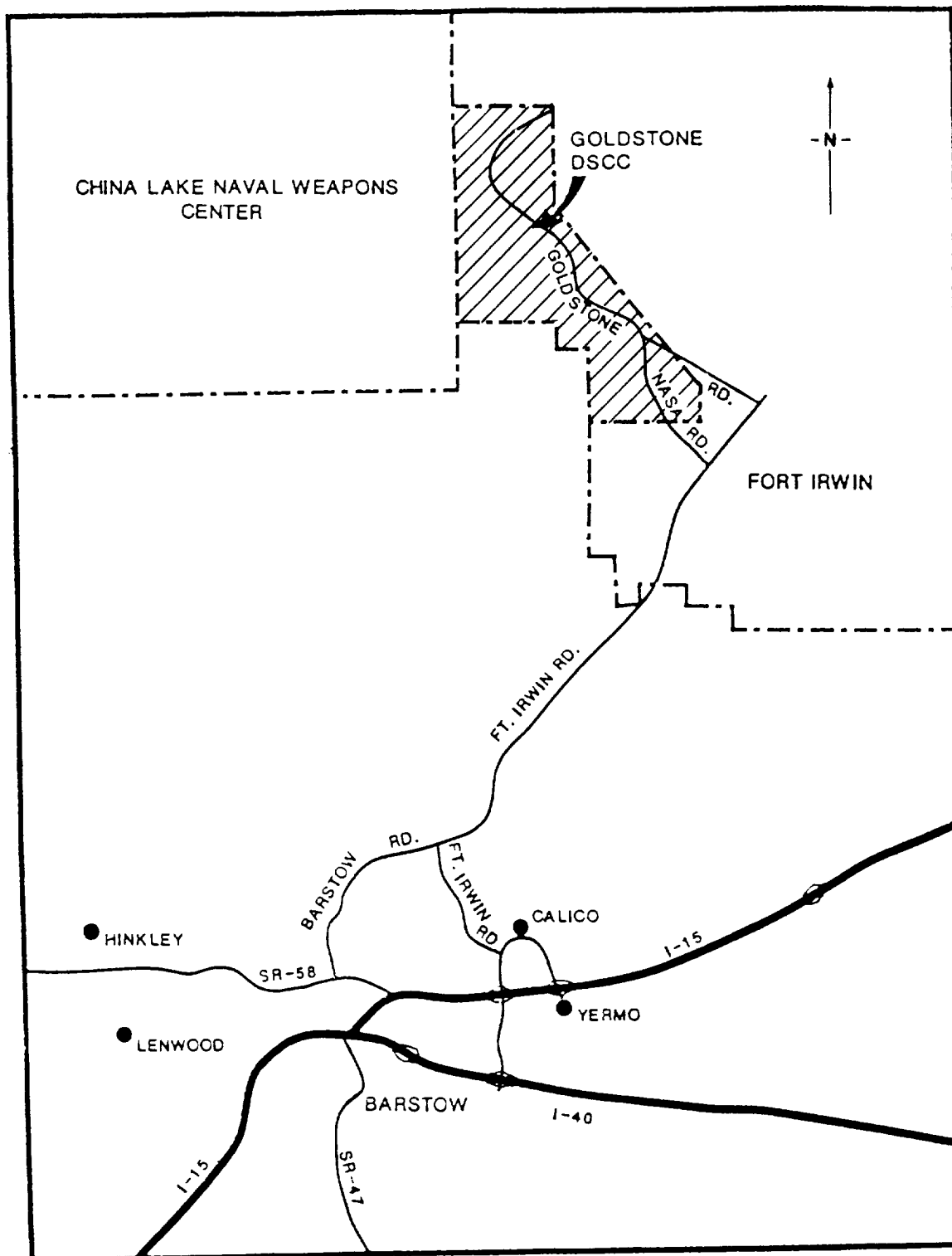


Figure 4. Major Roads Leading to and at the Goldstone DSCC

for prescheduled periods of time. Gasoline, diesel oil, and hydraulic oil are stored in double-walled underground storage tanks fitted with sensors between the walls to detect leaks. Water is supplied by Fort Irwin from groundwater basin wells. Sanitary sewage is discharged through septic tank systems to leaching fields. The Echo and Mars Sites discharge wastewater to evaporation ponds (see JPL Publication 87-4, Environmental Projects: Volume 8, Modifications of Wastewater Evaporation Ponds, October 15, 1989).

#### G. SOLID-WASTE MANAGEMENT FACILITIES AT THE GDSCC

At the Echo Site, the GDSCC operates its own 10-acre, Class III solid-waste landfill. This facility accepts only non-hazardous, solid wastes.

Most of a small quantity of hazardous waste, generated at the GDSCC each year, is sent to off-site commercial facilities for reclamation and eventual reuse. The remainder is transported to off-site commercial treatment or disposal facilities within 90 days of generation. The GDSCC now has two, new, properly managed storage facilities for hazardous materials and wastes, one at the Echo Site and the other at the Venus Site, but operates no facilities requiring a hazardous waste permit. Details concerning the construction of these two new storage facilities for hazardous materials and wastes at the Echo and Venus Sites are described in JPL Publication 87-4, Environmental Projects: Volume 9, Construction of Hazardous Materials Storage Facilities, November 15, 1989. Two more storage facilities for hazardous materials and wastes, one at the Mars Site and the other at the Apollo Site, will be completed in 1990. In accordance with its environmental management program, the GDSCC conducts all of its waste-management operations in strict compliance with environmental regulations, in a manner consistent with protection of human health and the environment.

#### H. WASTEWATER MANAGEMENT FACILITIES AT THE GDSCC

Four functioning sewage evaporation ponds - one pair at the Echo Site and another pair at the Mars Site - are designed to receive effluent from upstream septic tank systems. Extensive work was completed in the spring of 1989 to repair and reshape the previously eroded embankments of the wastewater evaporation ponds. Details of this construction work are recorded in JPL Publication 87-4, Environmental Projects: Volume 8, Modifications of Wastewater Evaporation Ponds, October 15, 1989.

#### I. OPERATIONAL RELATIONSHIPS BETWEEN THE GDSCC AND FORT IRWIN

Because the GDSCC is located within the Fort Irwin property, the two installations potentially can affect each other's roles and missions. Fort Irwin is a U.S. Army installation serving as the U.S. Army National Training Center (NTC). The remote desert environment allows military task forces to practice large-scale training maneuvers that could affect natural, historic, and cultural resources at the GDSCC. This especially is true when the maneuvers involve the movement of heavy equipment (tanks, large trucks) within the GDSCC. Most maneuvers occur at the eastern border of the GDSCC, and every effort is made by both the GDSCC and Ft. Irwin personnel to avoid the use of sensitive areas for such maneuvers.



## J. NATURAL ENVIRONMENTAL ASPECTS OF THE GDSCC

### 1. Geology

The GDSCC is located in the North Central section of the Mojave Desert Province. Typically, the Mojave Desert Province consists of broad, flat plains separated by low mountains (1,000 to 2,000 ft of topographic relief). The GDSCC is situated within one of these low mountain areas.

The GDSCC is located in a naturally occurring bowl-shaped depression bounded on three sides by geological faults. The Garlock Fault lies to the north, while the Blackwater and Calico Faults lie, respectively, to the west and south. The GDSCC is bounded on the east by the Tiefort Mountains. Each antenna site at the GDSCC is located on natural alluvial material, ranging in thickness from 15 feet at the Venus Site to more than 70 feet at the Echo Site. The alluvium is derived from the surrounding hills.

### 2. Hydrology

Groundwater in the Goldstone area is generally confined and is found at depths ranging from 170 ft near the Minitrack Site to approximately 1,000 ft below the Echo Site. Chemical analyses of the groundwater have yielded total dissolved solids (TDS) values in excess of 1,000 ppm indicating that the groundwater is brackish. The Goldstone Complex currently obtains potable water from a group of wells located at Fort Irwin, approximately ten miles to the southeast.

### 3. Climatic Conditions

The GDSCC lies within the U.S. Naval Weather Service's Southwest Desert, Climatic Area A. Mean annual temperatures for the area range from 50° to 80°F. Temperatures can climb as high as 114°F during the summer months, and drop as low as 11°F during the winter months. Mean annual precipitation for the area is approximately 2.5 in, with most precipitation falling between November and February.

### SECTION III

#### PURPOSE OF AND NEED FOR CONSTRUCTION OF AN ADDITION TO BUILDING G-86 AT THE MARS SITE

The Jet Propulsion Laboratory (JPL), in conjunction with the National Aeronautics and Space Administration (NASA), proposes to construct a 6,480-ft<sup>2</sup> addition to Building G-86 at the Mars Site, Goldstone Deep Space Communications Complex (GDSCC), Goldstone, California. See Figures 1 and 2 for regional and vicinity maps.

##### A. PURPOSE OF THE CONSTRUCTION OF THE PROPOSED ADDITION TO BUILDING G-86

The GDSCC is the largest of three DSN complexes located on three continents. As part of the NASA Deep Space Network, these complexes are among the world's largest and most sensitive scientific telecommunications and radio navigation networks.

The purpose of the construction of the proposed addition to building G-86 is to further develop deep space communications capabilities by providing space for new electronic equipment, and for the consolidation of monitoring and control activities at the GDSCC. The proposed building addition will support future sophisticated NASA spacecraft missions, including the International Solar and Terrestrial Physics Program (ISTP).

##### B. NEED FOR THE CONSTRUCTION OF THE PROPOSED ADDITION TO BUILDING G-86

The Signal Processing Center (SPC-10), located in building G-86 at the Mars Site at the GDSCC, is the result of a five-year DSN upgrade program completed in 1985 to provide centralized remote control and performance monitoring of the 34-meter antenna at the Echo Site (Echo Station DSS-12), the 34-meter antenna (Uranus Station, DSS-15), and the 70-meter antenna (Mars Station, DSS-14) at the Mars Site. The 26-meter antenna (Apollo Station, DSS-16) presently at the Apollo Site is as yet not equipped for remote-controlled operation, but will become so in about 1992. The SPC-10 contains various subsystems to point and control the antennas, to receive and process telemetry, to generate and transmit commands, and to produce spacecraft navigation data. Formerly, these subsystems were duplicated at each of the antenna stations. The centralized SPC-10 permits only a few technicians to operate all three remote-controlled antennas as required by any given day's tracking schedule. The SPC-10 is connected to the antennas by fiber-optic links, by terrestrial microwave, and by coaxial and electrical cables.

At present, temporary added support for SPC-10 is provided by a set of double-wide leased trailers located adjacent to Building G-86.

In 1990, however, the SPC-10 needs a 6,480-ft<sup>2</sup> addition to provide space for the consolidation of control room activities, and for new electronic equipment required to support the increase in spacecraft high-telemetry data rates and tracking-data mission-support loading. Modifications and extensions of the equipment in the control rooms will be generic in nature and will support all spacecraft projects, but are specifically required to support the International Solar and Terrestrial Physics (ISTP) Program. Additional equipment that will be

housed and supported includes a fifth telemetry and command group with its associated link monitor, control processor, and associated control consoles.

The ISTP program will study the environment of space between the Earth and the sun, specifically describing solar plasmas, high-energy particulate matter, and the sun's magnetic field. Expected benefits of the program will include a better understanding of the sunspot cycle and its effect on terrestrial climatic conditions.

## SECTION IV

### DESCRIPTION OF THE PROPOSED ADDITION TO BUILDING G-86 AT THE MARS SITE AND CONSIDERATIONS OF ALTERNATIVE ACTIONS

#### A. DESCRIPTION OF THE PROPOSED CONSTRUCTION OF THE ADDITION TO BUILDING G-86

Building G-86 is part of the Mars Site, which is located in the northern section of the GDSCC within the Fort Irwin National Training Center in San Bernardino County, California (Figures 1 and 2). The GDSCC is approximately 40 miles north of Barstow, California in the Mojave Desert. The complex covers 52 square miles and consists primarily of hilly topography with a desert scrub habitat. Access to the proposed addition to building G-86 is via the Mars Road.

The existing Mars Site facilities comprise 14 buildings, along with the 70-meter DSS-14 Mars antenna and the 34-meter DSS-15 Uranus antenna. The on-site existing structures provide for operations control, administration, fire fighting, storage, power generation, and equipment maintenance and repair. See Figure 5 for the existing Mars Site plan, and Figures 6 and 7 for photographs of Building G-86 and the proposed location of its addition.

The Mars Site is located on ground that slopes gently to the south and east at an approximate 2 percent grade. The existing G-86 Operations Building is located in the central portion of the Mars Site and is supported by offices, workshops and other facilities. The existing uses of the buildings at the Mars Site and their associated areas (in square feet) are provided in Table 2. There are 48 employees presently supporting the existing Mars Site facilities.

Electrical power for existing site operations is provided by the Southern California Edison Company. GDSCC on-site generators provide backup power. Elevated cable trays (trenched beneath roads) provide an interface between the antennas and the Operations Control Building.

The presently proposed project provides for construction of a 6,480-ft<sup>2</sup> addition to Building G-86. This would be a modular extension to an existing concrete-block building. Included in this project will be a cable- and air-conditioning plenum; a removable control-room modular-type computer floor; supporting equipment for heating, ventilating and air-conditioning systems; power, lighting, and acoustical controls; and fire-detection and suppression equipment. See Figure 8 for the proposed Mars Site plan.

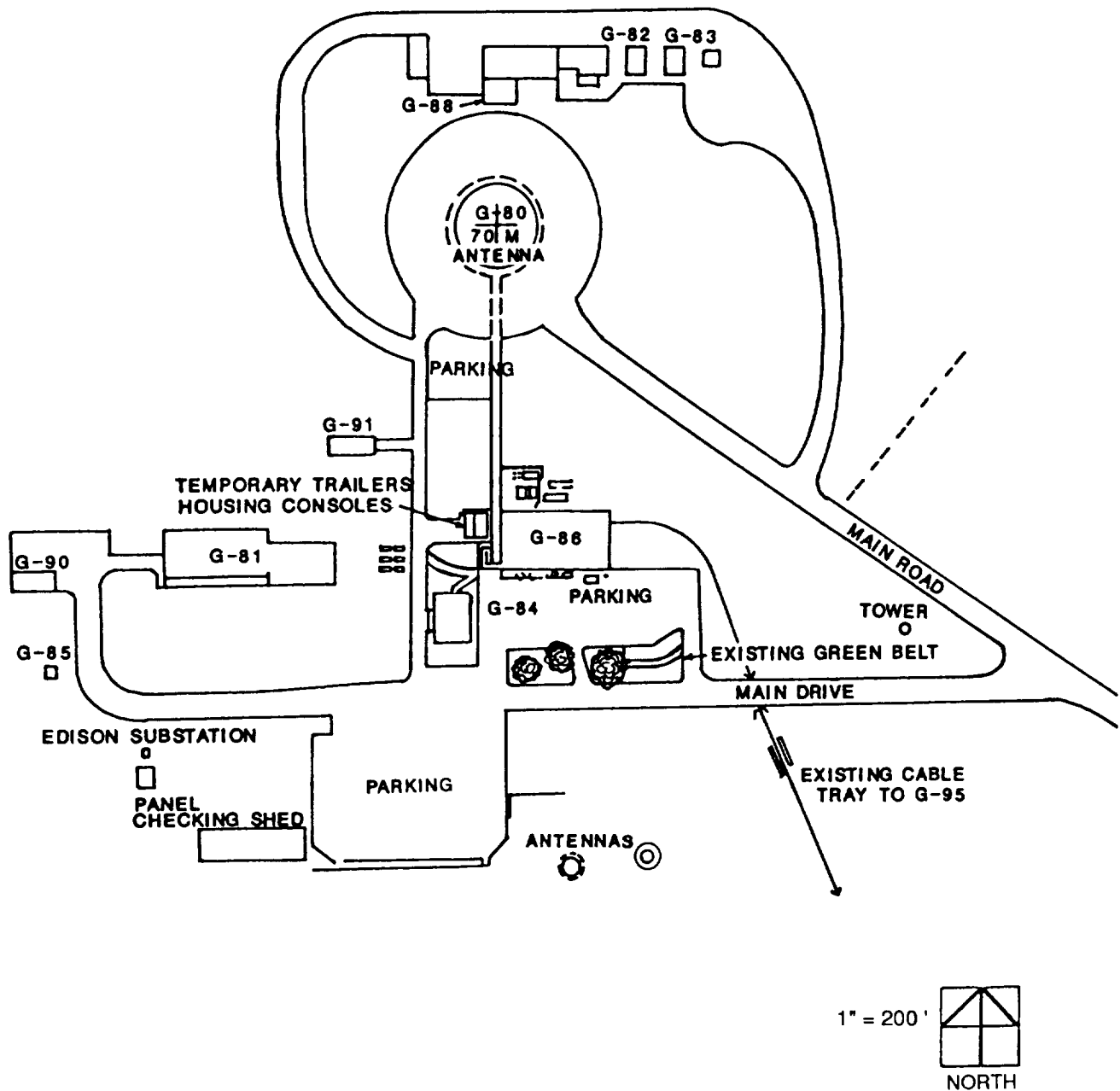


Figure 5. Mars Site: Existing Site Plan

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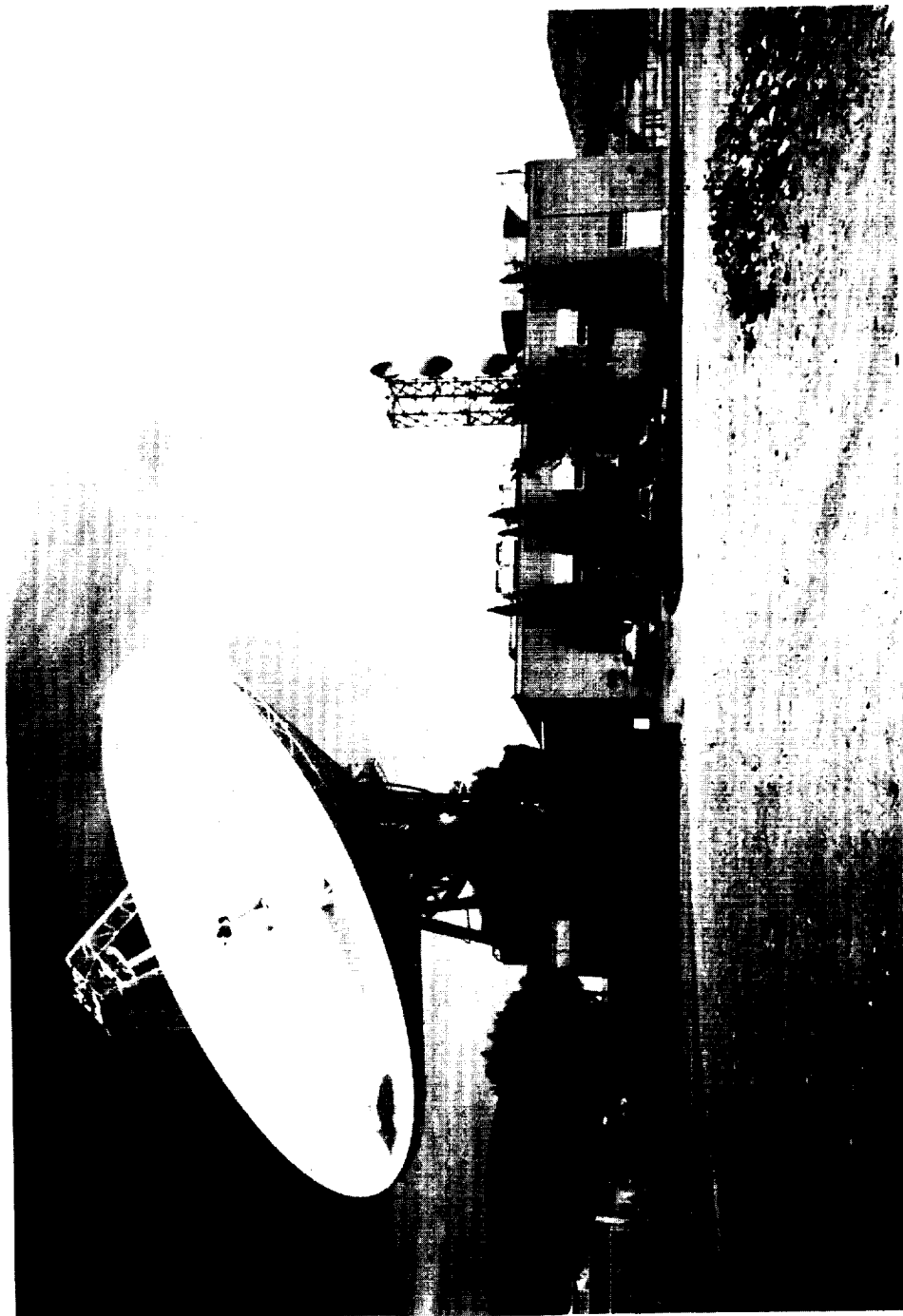


Figure 6. Photograph of the 70-m Antenna at the Mars Site. Building C-86 in Foreground

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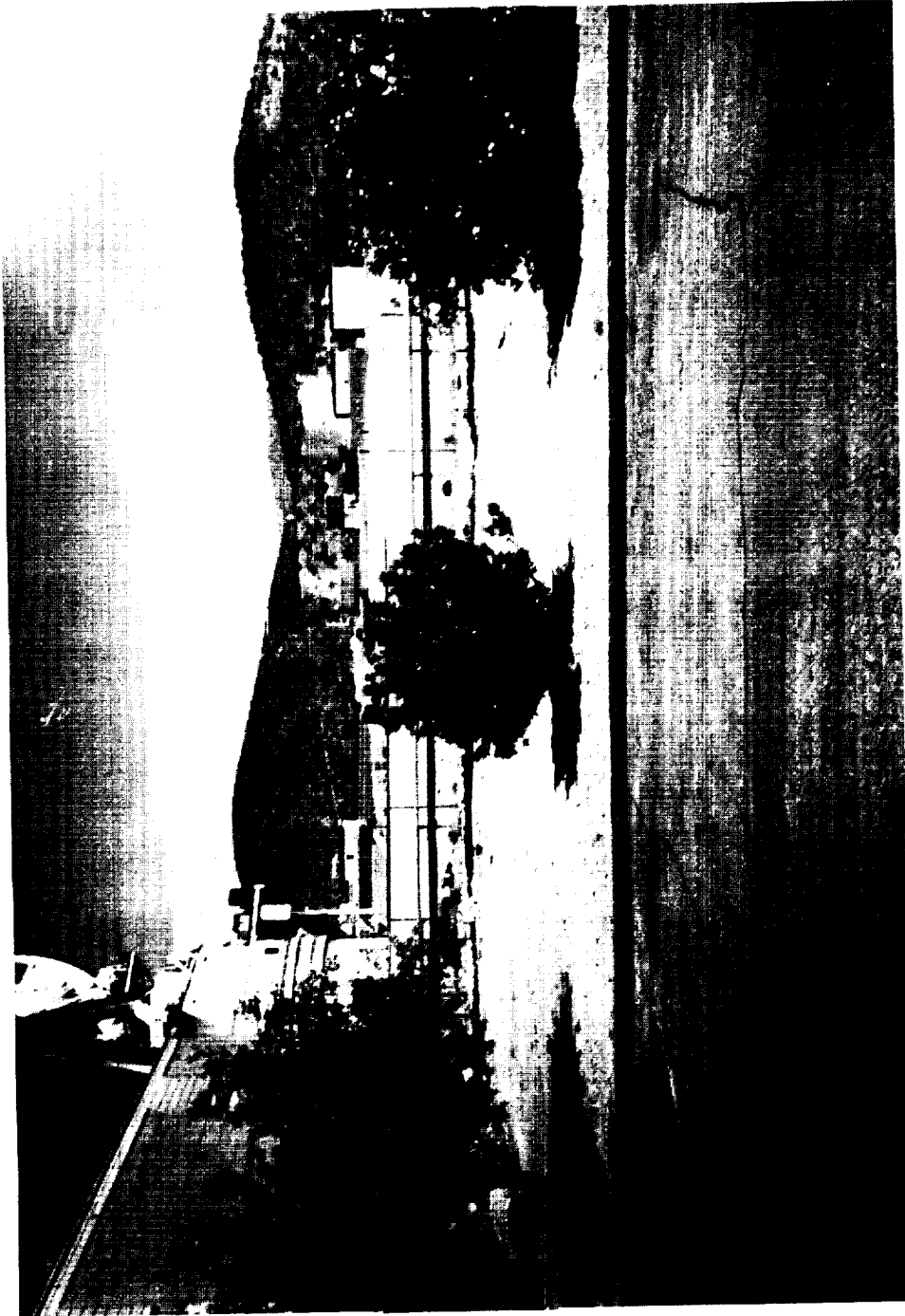


Figure 7. Mars Site: Proposed Location of Addition to Building G-86

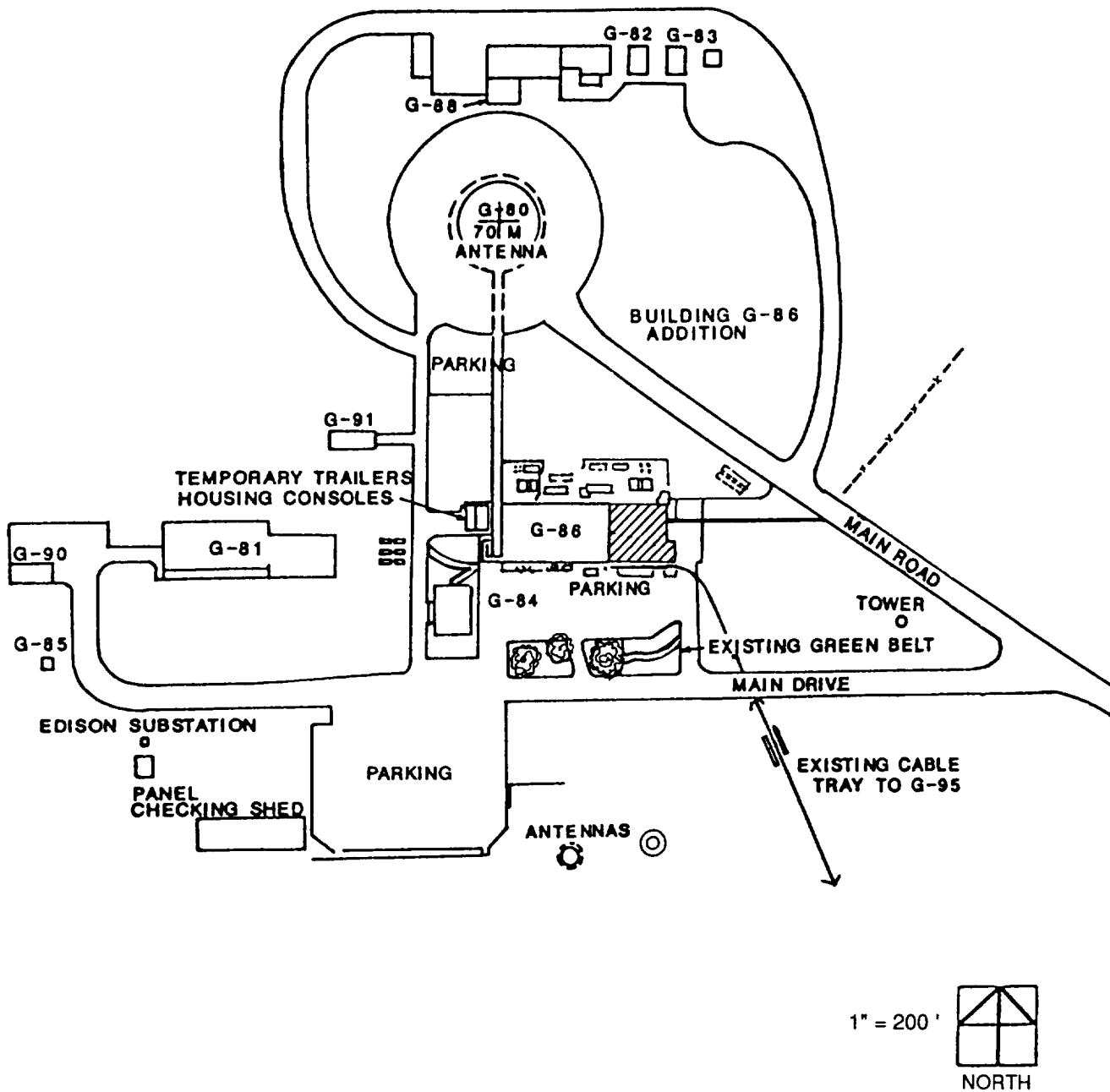


Figure 8. Mars Site: Proposed Site Plan



Table 2. Existing Structures at the Mars Site, GDSCC

Structure Number	Structure	Square Feet
G-80	70-m Antenna (230 ft)	9,326
G-81	Power Plant/Generator	7,350
G-82	Pump House	480
G-83	Cooling Tower	336
G-84	Training and Office Space	2,000
G-85	Flammable Storage	100
G-86	Operations Control (SPC-10)	6,480
	Associated Plenum	6,480
G-87	Security	160
G-88	Transformer Rectifier	624
G-89	Reverse Osmosis Equipment	500
G-90	Storage	882
G-91	Switchgear	896
G-94	Fire Line Pump House	500
G-95	34-m Antenna (111.5 feet)	---
G-96	Hazardous Material Storage Facility (to be constructed in 1990)	---
G-97	RF Maintenance	4,920
G-98	Digital and Antenna Maintenance	---

Source: Directory of Goldstone Buildings and Facilities. (Gold Book, Document Number 890-165, JPL internal document, Revised Edition, October 1989).

The proposed addition to building G-86 will provide space for consolidation of control room activities and new electronic equipment. This space is necessary to house and support a fifth telemetry and command string and tracking-data mission-support loading for all spacecraft projects, in general, and the ISTP Program, in particular.

The proposed addition will require the addition of ten (10) new personnel at the Mars Site. There will be two (2) additional heating, ventilating and air-conditioning (HVAC) systems. These additional systems, similar to those now at the G-86 building site, will be located to the north of the building addition. Noise levels originating from these new units will be no more than those of the existing units.

#### B. ALTERNATIVES TO CONSTRUCTION OF THE ADDITION TO BUILDING G-86 AT THE MARS SITE AT THE GDSCC

A number of alternatives to the proposed Mars Site building addition were considered as part of this EA. These included the alternative of nonconstruction of the proposed addition, along with the alternative of construction of the proposed addition at other locations inside and outside the GDSCC. The environmental advantages and disadvantages of these alternatives are described in more detail in the following paragraphs.

1. Alternative One: Non-Construction of the Addition to Building G-86

Discussion of the alternative that involves not constructing the proposed building G-86 addition is required under the National Environmental Policy Act (NEPA). No action means that the GDSCC will remain as it presently exists, with building G-86 housing the SPC-10 with its four telemetry and command strings. This would result in the inability of the SPC-10 to house a fifth telemetry and command string necessary to support the ISTP program beginning in 1990. Additionally, in the very near future, the required tracking-data mission-support loading needed for all spacecraft projects will greatly exceed the present capability of the SPC-10.

With respect to environmental considerations, the No-Action alternative will not require alteration of the present conditions. Thus, removal of habitats and construction-related effects associated with the proposed action would not occur. In spite of the minimal impact of these construction-related issues, their avoidance by the No Action alternative does not present a substantial environmental advantage.

The primary disadvantage of the No-Action alternative is the loss of opportunity to improve NASA deep space communications capability and to provide a means to advance specific scientific knowledge of space to a level not possible with the existing facilities.

2. Alternative Two: Constructing a Separate Control Operations Building at the Mars Site

The construction of a new, separate Control Operations building at the Mars site is a possible alternative. The construction of a separate building would have less impact on current operations, but potential locations for a separate building are restricted by topographic conditions at the Mars Site. A significant amount of terrain development to create a level area would be required.

With respect to environmental considerations, the construction of a separate building within the Mars Site would not result in environmental benefits. The geology, biology, and visual setting of other sites in the immediate vicinity of the Mars Site is similar to the proposed location. The lack of undeveloped level areas within the Mars Site would require grading of existing topography in relatively undisturbed habitats, which would have more of an environmental impact than construction at the presently proposed location of the building addition.

The primary disadvantage of constructing a separate building is that it is not considered to be as efficient from an operational viewpoint as is the proposed eastward extension of building G-86. A separate building would not allow for the direct extension of the current control-room rack layout with its associated cables and electronics.

3. Alternative Three: Relocation of the Addition of a Control Operations Building Within the GDSCC but at a Site Other Than the Mars Site

Relocation of the Operation Control Building addition within the GDSCC but at a site other than the Mars Site is a possible alternative to the proposed addition at the Mars Site. This would require the construction of an extensive

cable-tray and trench system necessary to connect the computer facilities with the antennas at the Mars Site. Separating the proposed building addition from the SPC-10 would also create numerous problems involving the coordination of activities and the overall operation of the DSS-14 Mars antenna and the DSS-15 Uranus antenna.

With respect to environmental considerations, the environmental impacts to be expected from location of the proposed project at the Mars Site would be minimal. The environmental impacts from locating the proposed project at another site would be much greater. Thus, there are no environmental benefits to be gained by relocating the project at another site within the GDSCC. There are no known sensitive environmental conditions at other GDSCC antenna sites that would preclude the relocation of the addition. The additional construction necessary for communications linkage with the Mars Site, however, would be an environmental disadvantage as compared to locating the building addition at the proposed Mars Site.

4. Alternative Four: Relocation of the Addition of a Control Operations Building to a Site Other Than the GDSCC

The location of the proposed building addition outside the GDSCC is a possible alternative to the proposed Mars Site. Although this alternative would require the relocation of the entire GDSCC complex, along with the Mars Site addition, this concept has been considered by NASA/JPL in the past. Likely locations for a new complex similar in size and function to the GDSCC include sites within Arizona and New Mexico. Minimum requirements include locating a substantial area of undeveloped land within the critical tracking range that is geographically compatible with DSN operations in Spain and Australia.

Off-site relocation of the proposed building addition is not the preferred alternative because of potential environmental concerns, excessive relocation costs, years of delays in project implementation incurred while seeking the necessary Congressional approval, and time incurred to redevelop a base of operating and maintenance capabilities.

With respect to environmental considerations, the relocation of the building addition project to an off-site location (e.g., Arizona, New Mexico) cannot be characterized sufficiently to provide a detailed environmental review. Moving the project to another distant location, however, would involve substantial additional construction activity, compared to the current plan for the building addition at the Mars site. This additional construction activity would pose a significant environmental disadvantage.

5. Preferred Alternative: Construction of the Addition to Building G-86 at the Mars Site

Location of the proposed building addition at the Mars Site is the preferred alternative since it would not result in significant environmental impacts, would result in the shortest implementation schedule, would be the most economical of the alternatives, and would provide the United States with an improved deep space communications capability.

## SECTION V

### ENVIRONMENTAL FACTORS AT THE GDSCC THAT MUST BE ASSESSED IN THE PROPOSED CONSTRUCTION AND UTILIZATION OF A 6,480-FT<sup>2</sup> ADDITION TO BUILDING G-86 AT THE MARS SITE

#### A. GEOLOGICAL SETTING

The GDSCC is located in the north central section of the Mojave Desert Province. The Mojave Desert Province consists of a wedge-shaped, down-faulted block that is bounded by mountain ranges to the north and southwest (Sharp, 1972). The structure and topography of the Province are largely fault controlled (Norris and Webb, 1976). The Mojave Desert is bounded on the south-southwest by the San Andreas Fault. The San Andreas Fault, which is the principal fault of a northwesterly trending shear zone, is at least 600 miles in length with 350 miles of right-lateral displacement. The Garlock Fault, at the northern boundary of the Province, trends to the northeast and east and has left-lateral displacement.

Elevations in the Goldstone area range from 2,895 to 4,491 feet above mean sea level (MSL). The GDSCC lies within a 70-mi<sup>2</sup> internal drainage area that includes Goldstone Lake, the largest of several dry lakes in the area. The elevation of Goldstone Lake is 3,021 feet above MSL (Kieffer, 1961).

The elevation of the Mars Site is approximately 3,280 feet above MSL. The terrain in the area of the proposed building-addition construction slopes gently to the south and east at an overall grade on the order of 2 percent. The site rests on Quaternary alluvium derived from neighboring highlands, including Pleistocene nonmarine sediments to the north, northeast and east; Tertiary andesites and andesitic breccias to the south, southwest and west; and Tertiary basaltic flows to the northwest.

#### B. CLIMATIC CONDITIONS

The climate at the GDSCC is arid with characteristic wide ranges in daily and seasonal temperatures, as well as high variability of precipitation. Average annual rainfall is approximately 5.5 in. Recorded annual precipitation ranges from a low of 0.5 in. to a high of 15 in. Precipitation is typified by short-lived, high-intensity storms that may produce local flash floods. More than one-half of the average annual precipitation has been known to fall in a three-day period, during which peak rainfall may be as high as two in./hr (Kieffer, 1961).

#### C. SEISMOLOGY

The Mojave Block is broken by several major vertical to near-vertical shear faults. The primary fault system in the Goldstone area trends northwest. The Goldstone area is located in a transition zone between the northwest-trending-structural area to the south, and an east-west-trending structural area to the north that roughly parallels the Garlock fault. Minor faults in the Goldstone area trend in nearly all directions, the main directions being west, northwest, and north (CDMG, 1963).

The two structural systems enclosing the Goldstone area are considered to be active, as evidenced by seismic ground motions associated with the release of stress within rock units along the San Andreas and Garlock structural systems and within the Mojave Block (Fife and Brown, 1980).

The GDSCC, including the Mars Site, is located within an area that has been classified as a seismic Zone 4 (Uniform Building Code, 1988, Earthquake Regulations, Chapter 23). A seismic Zone 4 corresponds to areas that are close to major fault zones and are within areas susceptible to damage corresponding to a Modified Mercalli Scale Intensity VIII or greater earthquake. (The Mercalli Scale is an arbitrary scale of earthquake intensity, ranging from I for an earthquake detectable only with instruments to XII for an earthquake resulting in total destruction.)

It appears likely that the Mars Site could be exposed to seismic shaking during an earthquake. The potential exists for structural damage to occur at the site from a seismic event. The extent of damage would be a function of soil composition, design of the structures, and their joint response to seismic shaking (Engineering-Science, 1987).

#### D. LITHOLOGY

Table 3 describes the generalized stratigraphic sequence of the Goldstone area, giving maximum thickness of each of the units and a brief lithologic description. It should be noted that this is a generalized sequence and that at a specific site some of the units may not be present or may not exhibit the reported maximum thickness. The general stratigraphic sequences provided in Table 3 were constructed from information obtained from Kieffer (1961).

#### E. GEOLOGICAL HISTORY OF THE GDSCC AREA

The following is a brief summary of the currently accepted interpretation of the geologic history of the Goldstone area (Kieffer, 1961, and Fife and Brown, 1980):

- (1) The Precambrian crystalline basement was formed through the accumulation of extrusive and intrusive igneous units and subsequent sedimentation on an evolving continental crustal plate. During late Precambrian and Paleozoic times, these rocks underwent folding, faulting and metamorphic recrystallization, and were later intruded by granitic (pegmatite) dikes (thin injections of molten rock).
- (2) Sedimentary units of the Rustic Formation were deposited within the Cordilleran geosyncline that had formed at the western boundary of the North American continental plate. The Cordilleran geosyncline was a complex of marginal and shallow marine depositional environments, along with island-arc volcanic terrains.

Table 3. Generalized Stratigraphic Sequence in the Goldstone Area  
(after Kieffer, 1961)

Series	Stratigraphic Unit	Maximum Thickness (ft)	Description
Quaternary (Pleistocene) <sup>a</sup>	Alluvial fan and channel gravels, lag gravels, and lacustrine deposits	300+	Composed of sand, cobbles, and boulders derived from intrusive and extrusive igneous rocks; alluvial fan and lag gravels moderately cemented in a caliche matrix. Lacustrine (playa lake) deposits are primarily silt and clay.
Quaternary (Pleistocene) <sup>a</sup>	Basaltic Flow	b	Vesicular olivine basalt, resistant to erosion, caps several ridges, dips gently north; offset by faults only in the south-east part of area.
Quaternary to Tertiary	Conglomeratic Sandstone	b	Overlies andesite south-east of Pink Canyon.
Quaternary to Tertiary	Black Glass Dikes	c	General trend N70E, intruded andesite flows only; assumed they occurred near end of andesite extrusion.
Tertiary	Andesite Flows	1000+	Thick sequence of lava flows; composed of andesite, with porphyritic hornblende and plagioclase; flowed from several volcanic vents; very resistant to erosion.
Tertiary	Andesite Breccia	600+ (with Tuff)	Angular blocks of volcanic rock, set in a matrix of volcanic ash; variably resistant to erosion.
Tertiary	Andesite Tuff	600+ (with Breccia)	Volcanic ash that is welded to loose; some pyroclasts; variable resistance to erosion.

Table 3 (Contd). Generalized Stratigraphic Sequence in the Goldstone Area  
(after Kieffer, 1961)

Series	Stratigraphic Unit	Maximum Thickness (ft)	Description
Cretaceous	Jack Spring Quartz Monzonite	c	Quartz monzonite pluton that extends over 85 square miles, relatively homogeneous, has an orthogonal fracture system and parallel jointing; resistant to erosion.
Paleozoic	Rustic Formation	b	Sedimentary and meta-sedimentary units derived from fine-grained marine sediments, foliated and moderately fractured, containing occasional quartz veins with gold and tungsten.
Paleozoic to Precambrian	Granitic Complex	c	Metamorphic and intrusive crystalline rocks; schists, gneisses, and granites highly fractured, low to moderate resistance to erosion.

<sup>a</sup> Deposition of alluvial and lag gravels and lacustrine deposits is believed to have begun during the Pleistocene Age. The olivine basalt is considered to be Pleistocene Age, but isotope dating to confirm the age of the basalt has not been conducted.

<sup>b</sup> Maximum thickness was not reported in available source literature.

<sup>c</sup> Thickness cannot be determined for this type of rock body.

- (3) Sedimentary units of the Rustic Formation and older Precambrian basement units were metamorphosed (subjected to high pressures and temperatures) during the late Paleozoic and Mesozoic eras. East-west compression of the Cordilleran geosyncline produced metamorphism, folding, and thrust faulting (displacement of older rock units on top of younger rock units) within sedimentary units deposited within the geosyncline. Although thrust faulting appears to have been most intense during the late Paleozoic and early Mesozoic eras, the juxtaposing of Precambrian units over Tertiary terrestrial sediments indicates that thrust faulting occurred as late as Tertiary time (Fife and Brown, 1980).
- (4) Magma (molten rock) of the Jack Spring Quartz Monzonite intruded into the existing older rocks, probably during Cretaceous time.
- (5) Uplift and erosion of the area occurred during late Mesozoic time, and most Paleozoic and Precambrian rocks were eroded away.
- (6) A broad basin formed in Tertiary (probably Miocene) time. Volcanic deposits composed of basalts, ash tuffs and andesite breccias covered the basin floor in layers up to 600 ft thick. Up to 1,000 ft of andesite lava flows originating from several volcanic vents covered the ash flow and breccia deposits. Black glass dikes intruded into the andesite flows.
- (7) Conglomeratic sandstone, containing clasts weathered from the surrounding mountains, was deposited discontinuously on the andesite lava beds during Tertiary and Quaternary times.
- (8) The region was uplifted and extensively faulted in Late Tertiary and Quaternary times. Faulting during Late Tertiary and Quaternary times was primarily normal. Transverse faulting was associated with the development of the San Andreas and Garlock fault zones.
- (9) Olivine basaltic flows covered parts of the region during the Pleistocene era. Since deposition of the basalts, the area has been tilted slightly to the north and extensively faulted in the southern part of the region.
- (10) Alluvium was deposited during Quaternary time, including: dry lake bed sediments; low-lying sand and gravel alluvium in the main valleys; gravel and boulder alluvial fans, lag gravels, and debris slope deposits; unconsolidated sand, gravel and boulders in stream channels; and windblown sand. The thickness of alluvial cover ranges from 0 ft on ridge crests and rock outcrops to 1,000 ft within the valleys.

#### F. TYPES OF SOILS AT THE GDSCC

The following four soil types described in accordance with the Unified Soil Classification System (USCS) occur at GDSCC:

- (1) Poorly to Well-Graded Gravels (GP to GW) with variable silt and sand derived from granitic rocks;



- (2) Poorly to Well-Graded Gravels (GP to GW) with variable silt and sand derived from decomposing volcanic rocks;
- (3) Poorly Graded Gravels (GP) derived from earlier, dissected alluvial deposits and terrace gravels (includes lag deposits); and
- (4) Clayey Silt (ML) to Clay (CL) deposited in lacustrine (playa lake) environments.

The typical soil profile in the area of the proposed building addition consists of a surficial layer of loose fill consisting of silty sand with little gravel. The average depth of this fill is approximately 8 in. The soil below natural grade consists of silty sand and gravel with scattered cobbles up to 3 in. in size (up to 40 percent). Boulders averaging 8 in. and some up to 12 in. in size have been unearthed in exploratory pits. This soil corresponds with soil types 2 and 3 described above (poorly to well-graded gravels).

Unconsolidated volcanic and granitic soils have medium to high porosity and permeability. Development of caliche layers (calcium carbonate cementation of soil layers), however, can greatly decrease the permeability of the soil.

Desert pavement (a residual layer of large soil particles left on the ground surface after the finer particles have been carried off by wind and water) has developed over virtually all soil surfaces. This layer is made up of lag gravels that protect the surface against further erosion. These gravels often are coated with oxides of iron and manganese, known as desert varnish, that give the surface a shiny appearance.

## G. WATER RESOURCES AND FLOODPLAINS

### 1. Water Resources

There are no permanent streams at the GDSCC. Surface water flow occurs only after intense rainfall periods, and the water quickly infiltrates into the dry desert soils or evaporates. During heavy rainfall, water reaches Goldstone Lake, which becomes inundated for short periods. This intermittent water supply is inappropriate for domestic and other planned uses due to its high levels of suspended and dissolved solids and very short-term availability. The Mojave River Groundwater Basin (which includes the GDSCC) is recharged by only two sources: rainfall and the Mojave River (Department of the Army, 1979).

The GDSCC receives potable water from a group of six wells located within the vicinity of Fort Irwin. These wells draw from the Bicycle Lake groundwater basin and from the Fort Irwin groundwater basin, both of which are subunits of the Mojave River Groundwater Basin. About 1,000,000 gallons of water are pumped monthly from Fort Irwin to the GDSCC.

### 2. Floodplains

The Federal Emergency Management Agency (FEMA) has not mapped floodplains for the Fort Irwin Reservation, including the GDSCC. However, 90 percent of the area in the southeast desert of California is classified as Zone D, in accordance with FEMA definitions (A. Russell 1987). Therefore, the GDSCC is most likely to be classified as Zone D, an area of undetermined but possible flood hazard. In

the desert environment, in general, high-intensity storms may produce flash flooding. The GDSCC, however, has not experienced flood-related problems in the past.

One wash (intermittent streambed) is located immediately east and southeast of the Mars Site. It averages 6 feet in width and 3 feet in depth. Culverts beneath Mars Road and the 70-meter antenna access road allow the wash to drain past the Mars Site.

## H. BIOTIC RESOURCES, ENDANGERED SPECIES, AND WETLANDS

### 1. Biotic Resources

The biotic composition at the site of the proposed building addition at the Mars Site was determined from information compiled during field reconnaissance, supplemented by information obtained from the existing literature. The site was surveyed May 6, 1989, on foot by the MBGA project team. Weather at the time of the survey was warm, with temperatures of 35 degrees Celsius (95 degrees Fahrenheit), and mild winds of 0 to 5 miles per hour (mph).

The proposed building site and a 100-meter buffer area around the site were examined. Floral constituents encountered were recorded in terms of relative abundance and habitat type. Faunal constituents were determined through field identification, combined with documented habitat preferences of regional wildlife species that, whether or not detected during the survey, are thought to include the site within their range. The overall biotic composition was derived from this information.

### 2. Vegetation

The vegetation on and around the project site is typical of a diverse mid-elevation Mojave Desert creosote bush scrub community. Perennial plant species encountered on the project site were creosote bush (Larrea tridentata), bursage (Ambrosia dumosa), cheese-bush (Hymenoclea Salsola), desert trumpet (Eriogonum inflatum), Encelia virginensis, chuckwalla's delight (Stephanomeria pauciflora), Anderson's thornbush (Lycium andersonii), and Gutierrezia microcephala. Ornamental plants found on the site not typical of this desert plant community include pampas grass, mulberry tree, oleander bush, olive tree, and cottonwood tree. Annual species present at the time of the survey included red-stemmed filare (Erodium cicutarium), skeleton weed (Eriogonum deflexum), and russian thistle (Salsola kali). Grasses present include foxtail chess (Bromus rubens) and arabian mus (Schismus arabicus).

### 3. Wildlife

Based on field observation and the existing literature, wildlife expected or observed to occur in the habitats of the proposed project site and surrounding area are described below.

a. Amphibians and Reptiles. No amphibians were observed or are expected due to the absence of surface water on the proposed project site. A variety of lizards and snakes are expected to occur in the proposed project vicinity. Common lizards include the western whiptail (Cnemidophorus tigris), zebra-tailed lizard

(Callisaurus draconoides), desert horned lizard (Phrynosoma platyrhinos), and side-blotched lizard (Uta stansburiana). Other reptile species found with some frequency throughout the creosote bush scrub community are desert iguana (Dipsosaurus dorsalis), desert tortoise (Gopherus agassizii), common leopard lizard (Cambelia wislizenii), coachwhip snake (Masticophis flagellum), gopher snake (Pituophis melanoleucus), sidewinder (Crotalus cerastes), and Mojave green rattlesnake (Crotalus scutulatus).

Although weather conditions were suitable for reptile activity at the time of the survey, no reptiles were observed at the proposed project site. No signs (tracks or burrows) of the desert tortoise were seen on the proposed project site nor within a 100-meter strip of land surrounding the site.

b. Birds. A number of birds are expected to breed in the creosote bush scrub community within the vicinity of the proposed project. Species observed in the vicinity of the proposed project during the MBGA site inspection were chukar (Alectoris chukar), western kingbird (Tyrannus verticalis), ladder-backed woodpecker (Picoides scalaris), and horned lark (Eremophila alpestris). No breeding activity was observed on the proposed project site.

Five species of raptors (birds of prey) may breed in the vicinity of the proposed project site and may utilize the site for foraging. These include the common raven (Corvus corax), common barn owl (Tyto alba), red-tailed hawk (Buteo jamaicensis), prairie falcon (Falco mexicanus), and golden eagle (Aquila chrysaetos). The only raptor observed in the vicinity of the proposed project site during the May 6, 1989, field reconnaissance was the common raven.

c. Mammals. Most desert-dwelling small mammals are nocturnal and would not be expected to be observed at the time of the MBGA field survey. Small mammals expected to occur in the vicinity of the project site include the long-tailed pocket mouse (Perognathus formosa), Merriam's kangaroo rat (Dipodomys merriami), deer mouse (Peromyscus maniculatus), the desert wood rat (Neotoma lepida), and the Mojave ground squirrel (Spermophilus mohavensis). Larger mammals expected to occur at the GDSCC include the black-tailed jackrabbit (Lepus californicus), and the desert cottontail (Sylvilagus audubonii).

Predators expected in the proposed project area include the coyote (Canis latrans), kit fox (Vulpes macrotis), ringtail cat (Bassariscus astutus), and bobcat (Felis rufus).

#### 4. Impacts Upon the Biotic Resources of the Proposed Project Site and Their Mitigations

Impacts to the biotic resources of the proposed project site are expected to be minimal due to the small size of the proposed project area and its location adjacent to roads and human activity. Project implementation would result in the removal of no sensitive or otherwise protected plant species. Because the proposed project site is located adjacent to several other structures, roads, and parking areas, it is not a valuable wildlife habitat. Any wildlife presently utilizing the proposed project site would be fairly insensitive to impacts of human activities. Impacts to wildlife as a result of implementation of the proposed project, therefore, would be minimal.

## 5. Endangered Species

No federally listed threatened or endangered species (Tables 4 and 5) were located on the site, nor are any expected to occur due to the proximity of the site to developed areas. No effects to federally protected rare, threatened, or endangered species, therefore, would occur as a result of project implementation.

The desert tortoise is a BLM "sensitive species." The U.S. Fish and Wildlife Service (FWS) has categorized the desert tortoise as a Category II species, but listing has been precluded by higher priorities. The desert tortoise has been petitioned for candidacy for state "Threatened" status in California. The petition has been accepted by the California Fish and Game Commission. It has not been determined, however, whether listing is warranted. No sightings or sign (e.g., scat or burrows) of the desert tortoise were observed at the time of the field survey.

No California-listed sensitive, rare, threatened, or endangered plant or wildlife species were observed at the proposed project site. No effects to California-listed sensitive, rare, threatened, or endangered species, therefore, would occur as a result of this project.

## 6. Wetlands

No wetlands in the form of springs or seeps are present in the immediate vicinity of the proposed project site. One potential wetland occurs in the form of a small ditch through the site and supports a small population of cattails (*Typha* sp.). The ditch was dry at the time of the survey, however, and no wildlife species were found in the vicinity. No playas (dry lakes or areas where standing water may accumulate during or after a storm) are present on or in the immediate vicinity of the proposed project.

# I. AIR RESOURCES

## 1. Meteorology

Climatic conditions at the GDSCC are those typical of a high desert. Summers are hot and arid, while winters are relatively cool, with little precipitation and frequent strong westerly winds. Occasionally, there are summer showers and thunderstorms that produce flash flooding. During the winter months, local dust storms often accompany the occasionally strong winds.

## 2. Air Quality

The project site is located in the Southeast Desert Air Basin (SEDAB), an area that complies with environmental limits for all primary air pollutants except ozone. Air pollutant emissions from the GDSCC are primarily from storage and use of hydrocarbon fuels, a spray booth and degreaser, diesel-engine generators, and wipe-solvents.

The proposed project would not substantially increase fuel consumption for heating purposes. There will be two additional HVAC systems, located to the north of the building addition, that are similar to those now existing at the present building site. There are no plans to increase energy consumption for other

Table 4. Sensitive Plant Species that Potentially Could Occur at the GDSCC<sup>a</sup>

Species	Status		Habitat
	FWS	CNPS	
<u>Androstephium breviflorum</u> Small-flowered androstephium	--	2 <sup>b</sup>	Gravelly to rocky soils below 7,000 ft
<u>Astragalus jaegerianus</u> <sup>c</sup> Jaeger's locoweed	C2 <sup>c</sup>	1B <sup>d</sup>	Sandy to gravelly soils below 4,000 ft
<u>Chorizanthe spinosa</u> Mojave spiny-herb	C3 <sup>e</sup>	4 <sup>f</sup>	Same
<u>Cymopterus deserticolus</u> Desert cymopterus	C2	1B	Same
<u>Dudleya saxosa</u> ssp. <u>saxosa</u> Panamint dudleya	C2	4	Same
<u>Eriophyllum mohavense</u> Mojave eriophyllum	C2	1B	Same
<u>Linanthus arenicola</u> Sand linanthus	C3 <sup>c</sup>	2	Deep sandy soils
<u>Psorothamnus arborescens</u> Mojave indigo bush var. <u>arborescens</u> ( <u>Dalea a.</u> )	C3 <sup>c</sup>	4	Same
<u>Sclerocactus polyancistrus</u> Mojave fish-hook cactus	C2	4	Rocky soils

<sup>a</sup> Listing agencies/organizations:

FWS: U.S. Fish and Wildlife Service (USFWS, 1986).

CNPS: California Native Plant Society.

Note: The California Fish and Game Department has no listing for this area.

<sup>b</sup> Rare or endangered in California, but more common elsewhere.

<sup>c</sup> Federal Category 2 candidate in which a decline of the species is suspected. Insufficient data exist, however, to support a proposed listing.

<sup>d</sup> Considered rare and endangered throughout its range.

<sup>e</sup> Species is too widespread to warrant listing.

<sup>f</sup> Species has limited distribution.

Table 5. Sensitive Wildlife Species Known From the Vicinity of the GDSCC<sup>a</sup>

Species	Status <sup>b</sup>				Habitat
	FWS	CDF	GPS	NAS	
<u>Gopherus agassizii</u> Desert tortoise	C2 <sup>c</sup>	--	S <sup>d</sup>	--	Creosote bush scrub
<u>Aquila chrysaetos</u> Golden eagle	--	SC3 <sup>e</sup>	PS <sup>f</sup>	--	Nests in cliffs; forages over creosote bush scrub
<u>Falco mexicanus</u> Prairie falcon	--	SC3	--	--	Same
<u>Athene cunicularia</u> Burrowing owl	--	SC2 <sup>g</sup>	--	2 <sup>h</sup>	Nests in banks of washes and road cuts
<u>Spermophilus mohavensis</u> Mojave ground squirrel	--	T <sup>i</sup>	--	--	Creosote bush scrub

<sup>a</sup> None of the listed species actually were identified at the project site during the MBGA survey.

<sup>b</sup> Listing agencies:

FWS: U.S. Fish and Wildlife Service (USFWS, 1986).

CDFG: California Department of Fish and Game (CDFG 1980, 1985, 1986).

BLM: Bureau of Land Management (BLM, 1980).

NAS: National Audubon Society (NAS, 1986).

<sup>c</sup> Federal Category 2: Sufficient data exist to suggest that threatened or endangered status may be warranted.

<sup>d</sup> BLM considers this species to be sensitive due to small population size, limited distribution, or threat from human activities.

<sup>e</sup> State Species of Special Concern, List 3: Species not in immediate danger of extinction. Small population sizes, however, warrant observation.

<sup>f</sup> BLM proposed sensitive species, pending the accumulation of sufficient data to support concern.

<sup>g</sup> State Species of Special Concern, List 2: Species warrants active monitoring due to population decline.

<sup>h</sup> NAS second priority species: Special concern due to observed decline in population.

<sup>i</sup> State-listed as threatened.

purposes or to add new equipment that would increase the present level of emissions. Thus, it is not anticipated that the proposed project would result in any significant impact on basin air quality from stationary sources.

There would be a minor increase in mobile-source emissions as a result of the proposed project, since it is anticipated to increase the total workforce by ten persons. Because carpooling and vanpooling are the predominant methods of transportation at the GDSCC, it is anticipated that vehicle traffic and associated emissions would increase by approximately 3 to 5 round-trips per workday. This would represent an increase of 3 to 5 percent in mobile emissions. Such an increase is not negligible, but is not considered significant due to the low overall levels of emissions at the GDSCC.

Emissions generated during site preparation and construction of the proposed building addition will come primarily from the exhaust emissions of construction equipment and fugitive dust generated by soil movement. These emissions will be of short-term duration and, for the most part, will be confined to the Mars Site, resulting in an insignificant impact on local air quality.

## J. HUMAN ENVIRONMENT

### 1. Land Use and Socioeconomics

The GDSCC is located within the Fort Irwin Military Reservation, a U.S. Army installation under the control of the Department of Defense. The GDSCC is a 52-square-mile complex with extremely low-density development. Because of its mission, the GDSCC is highly sensitive to physical and electromagnetic interference and thus requires large surrounding areas with minimal activity and development.

With Fort Irwin bordering the GDSCC on the north, east, and southeast, the potential for incompatible activities and actions exists unless both facilities operate in a cooperative manner. Of primary concern are the 20 to 25 "critical" and 35 to 40 "semicritical" days per year when GDSCC transmissions require absolute freedom from physical and electromagnetic interference. While critical-day activities have not yet been violated, this is still an area of concern. Memoranda of understanding have been signed addressing the responsibilities of both Fort Irwin and the GDSCC.

The GDSCC, including the Mars Site, is designated as Rural Conservation (RCN) in the County of San Bernardino General Plan (San Bernardino County, 1986). The RCN designation permits a variety of low-intensity land uses such as agricultural croplands, mining areas, national forest, wilderness, and residential units on minimum lot sizes of 40 acres. The proposed 6,480-ft<sup>2</sup> building addition at the Mars Site is included in the GDSCC development plans. The proposed project is consistent with the County's General Plan.

The proposed building addition will be compatible with existing uses at the GDSCC and will support the existing DSN activities. The building addition will be constructed over a 9-month period.

The existing Mars Site has 48 full-time employees who support the operations of the Mars Site. The proposed building addition and associated facilities will

require the hiring of ten additional employees, representing a 4.4 percent increase in total GDSCC staff. No long-term socioeconomic impact from this level of increased employment is expected on GDSCC or regional demographics.

## 2. Vehicular Traffic and Circulation

Vehicular access to the Mars Site at the GDSCC is provided via the Mars Road, a two-lane, paved surface road. Mars Road intersects Goldstone Road and traverses west-northwest approximately 1 mile to the Mars Site. The proposed building addition will be located close to the existing infrastructure and will not require the construction of any new roads.

The employment level at the Mars Site and the GDSCC will increase by ten personnel when the building addition is placed in operation. A 3 to 5 percent increase in total local traffic is expected as a result of the proposed project. This is not considered to be a significant increase due to the overall low level of traffic, and associated low level of environmental impacts, at the GDSCC.

A minor amount of temporary construction traffic would occur. The small number of trips, the relatively short duration of the construction activity, and the low level of roadway usage, however, preclude any significant impacts to local roadways.

## 3. Noise

The GDSCC noise environment is typical of quiet desert locations. The sparsely developed complex and restricted airspace, which are required to minimize interference with communications, serve to promote a quiet environment.

Noise sources originating from the GDSCC include minor, intermittent surface traffic, occasional aircraft operations, and activities at other remote GDSCC operating sites. With a total staff of only about 217 at the GDSCC, surface traffic and its associated noise impact are at a relatively low level. Air traffic at the airport at Goldstone Dry Lake is limited to propeller-driven aircraft. Flights include three scheduled NASA flights per week and infrequent flights of military administrative personnel. Mechanical equipment in use at the GDSCC also contributes to the overall noise environment. Even the loudest generators, pumps, and other mechanical equipment present at any particular site, however, produce a highly localized noise impact that does not extend more than a few hundred feet from its source.

Over the short term, noise impacts at the proposed project site would involve additional construction traffic noise and noise from site preparation (earth moving and excavation) and erection of facilities. Since the proposed project location is in a remote area with no noise-sensitive land uses within miles, short-term noise impacts are expected to be insignificant. Long-term noise generation is expected from the proposed building addition's cooling/ventilation systems and from slightly increased motor vehicle usage. Since the proposed project is an expansion of existing facilities and would result in only a small increase in total personnel, these changes to the existing noise environment are not expected to be significant.



#### 4. Cultural Resources

An abundance of archeologic and historic resources exists in the Mojave Desert, and especially within the boundary of Fort Irwin and the GDSCC. Since access to these installations is controlled, only a few archeologic sites have been discovered. Fort Irwin employs a resident archeologist who has documented areas of archeologic, prehistoric, and historic interest as well as fossil areas within the Fort Irwin and GDSCC boundaries. A large area within the GDSCC is designated as an area of archeologic and historic interest. This site is located in and around Goldstone Lake, approximately three miles south of the Mars Site (JPL, 1988). The Fort Irwin archeologist recently conducted a survey of the Mars Site and found no indication that significant archeologic or historic resources exist at the proposed location of the building addition (Appendix A).

#### 5. Solid and Hazardous Wastes, Toxic Substances, and Pesticides

a. Solid Wastes: The GDSCC operates one 10-acre, Class III solid-waste landfill, of which only 6 acres are active. The landfill, which is located at the Echo Site, is properly permitted and has a projected remaining life of four years. Only non-putrescible, non-liquid solid wastes are accepted for burial. No hazardous materials are placed in the landfill.

Adverse impacts from solid-waste generation are not anticipated as a result of the proposed project because:

- (1) Only a small number of additional staff are required to operate the electronic equipment to be housed in the proposed building addition to G-86.
- (2) Daily activities in the proposed building addition will result in a less than 4 percent increase in solid-waste generation.
- (3) Types of solid wastes generated are not expected to change from those generated at the present time.

b. Toxic Substances and Hazardous Wastes: The GDSCC does not use or store large quantities of toxic or hazardous substances. The substances used in greatest quantities are fuels and oils. Purchase of drummed liquids is kept to a minimum.

The GDSCC now operates one main drum storage area at the Mars Site. This facility, which is environmentally substandard, consists of drums stored on locked, metal, dispensing racks situated on a concrete pad (Figure 9). The facility is properly equipped with warning signs, fire extinguishers, and materials for spill cleanup. Small quantities of containerized substances are stored throughout the complex in a manner consistent with procedures established by the GDSCC Environmental Office. Storage locations are inspected routinely. Typically, only the quantity of material needed to support operations is distributed for storage at each workplace.

A new storage facility for hazardous materials and wastes will be constructed at the Mars Site in 1990. The new facility will be similar to the new facility constructed at the Echo Site as described in JPL Publication 87-4,

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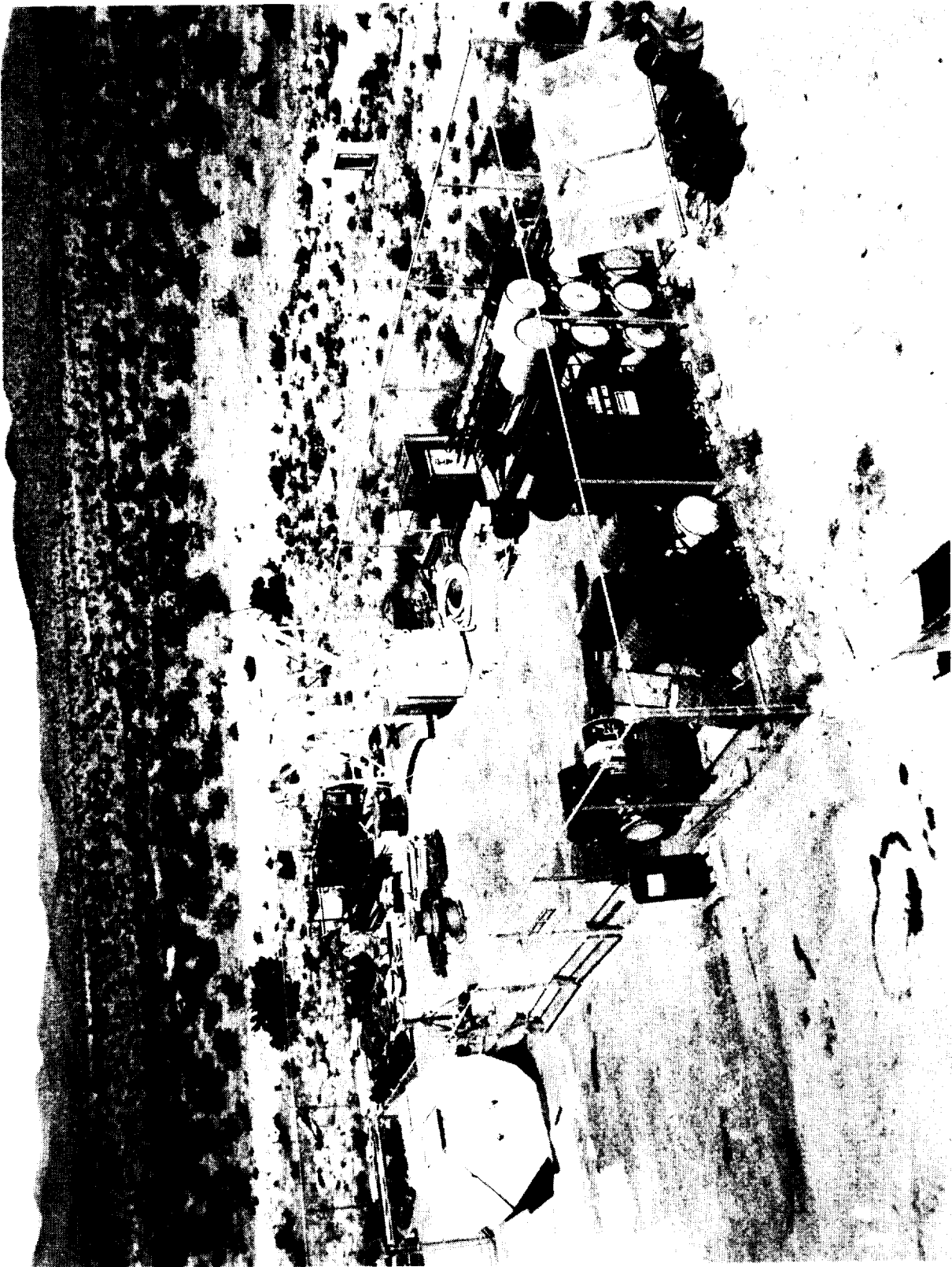


Figure 9. Mars Site: Substandard Storage Area for Hazardous Materials and Wastes Will Be Replaced by New, Environmentally Acceptable Storage Facility in 1990.

Environmental Projects: Volume 9, Construction of Hazardous Materials Storage Facilities, November 15, 1989. The new, environmentally acceptable storage facilities for hazardous material and wastes, as it now exists at the Echo Site, is depicted in Figure 10.

Bulk products (primarily fuels and oils) are stored in permitted underground tanks in conformance with prevailing underground-tank regulations. There currently are 13 underground tanks in use for storage of bulk fuels and oils at the GDSCC. All 13 tanks are of recent installation and are of double-wall construction with leak-detection systems.

Hazardous waste generated at the GDSCC is collected in drums at designated accumulation points throughout the complex. Accumulation points are maintained in conformance with procedures established by the GDSCC Environmental Office, and are inspected on a regular basis. Waste is transported from each accumulation point to a central staging facility located at the Echo Site. At this facility, all hazardous waste containers are readied for off-site transport to a commercial, permitted Hazardous Waste Management Facility for either treatment, recycling, or disposal, as appropriate. The GDSCC policy requires keeping waste generation to a minimum and supports detoxification, reclamation, and reuse of wastes in preference to their disposal.

Materials to be stored at the Mars Site to support the proposed operations are not expected to be substantially different in quantity or type from what is stored to support current operations. The waste-generation rate presently is very low (primarily oily waste), and also is not expected to differ significantly after the building addition project is implemented. Furthermore, the GDSCC has an active environmental program that includes routine monitoring of hazardous materials and waste management practices at each antenna station by the GDSCC Environmental Coordinator. Consequently, no adverse effects from hazardous substances are anticipated.

c. Pesticides: The GDSCC does not directly purchase, store, or use pesticides. All pesticide application is by a licensed contract firm that brings spray applicators containing premixed pesticide to the complex, applies the pesticide under the direction of the Complex Environmental Officer, and removes from the premises all remaining product and spent canisters. Virtually all pesticide application is to the interior of buildings. If it is necessary to spray outside areas prior to initiating construction, Natural Resource Management personnel from Fort Irwin or from the private sector will be consulted to ensure that spraying will not affect environmental resources.

d. Summary of Hazardous Materials Use, Generation of Solid and Hazardous Wastes, and the Use of Pesticides at the Proposed Building Addition at the Mars Site: The proposed Mars Site building-addition project will involve the hiring of 10 new employees, which represents a 4 percent expansion over the current level of manpower. This increase would not create a significant increase in hazardous materials use, solid-waste generation, or hazardous waste generation.

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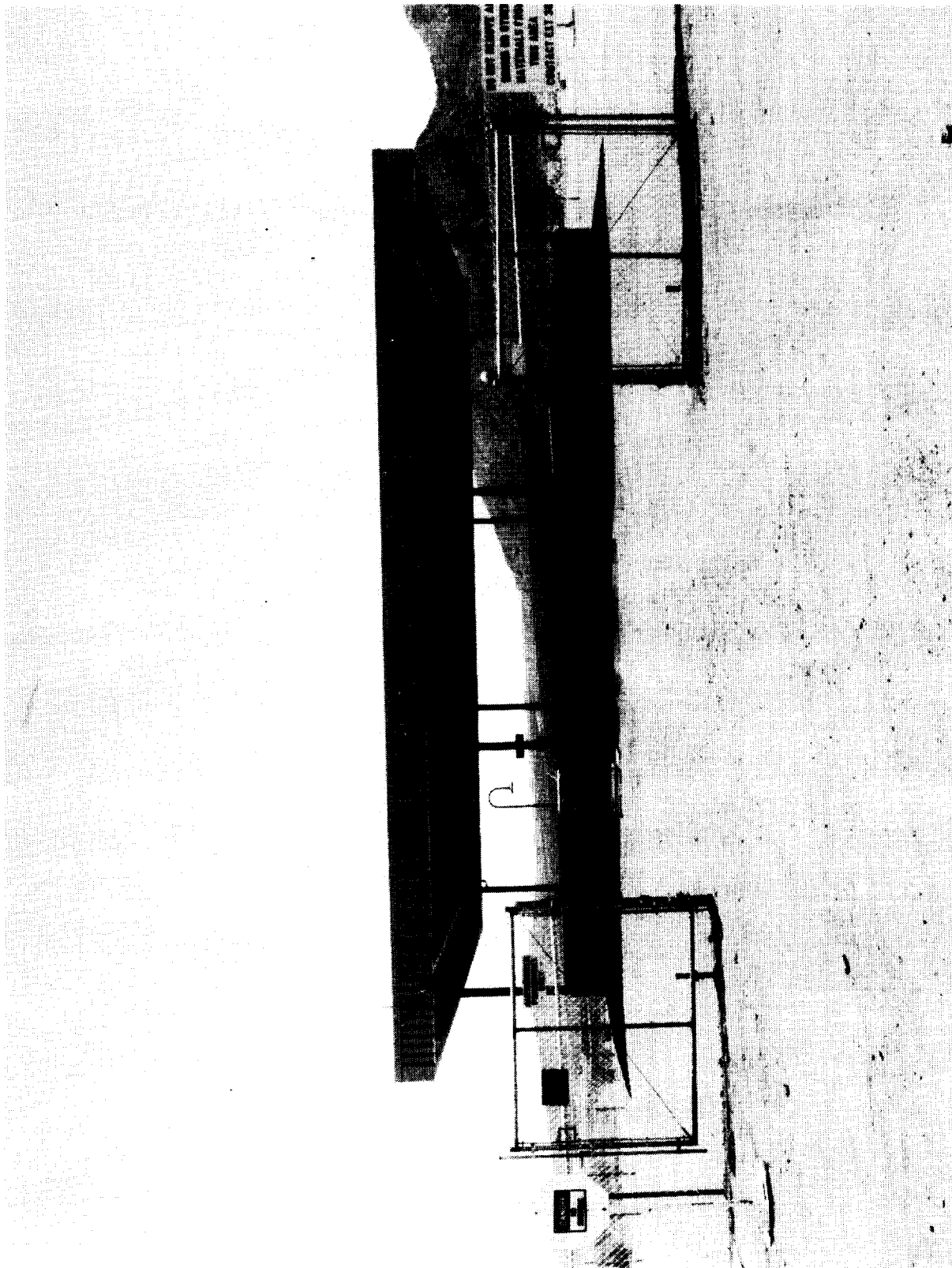


Figure 10. Echo Site: Completed Storage Facility for Hazardous Materials and Wastes.  
The New Hazardous Materials and Wastes Storage Facility to Be Constructed  
at the Mars Site Will Be Similar to This Echo Site Facility.

## 6. Health and Safety

The 6,480-ft<sup>2</sup> building-addition design is required to meet the standards of prevailing health and safety codes and of seismic risk zone Number 4. The safety provisions at the proposed building-addition site will be similar to those for other buildings located at the Mars Site.

## 7. Aesthetics

A typical view at the Mars Site can be seen in Figure 11. The building addition will be designed to match the existing building's exterior finish, with similar window and door treatment. A proposed loading dock at the east end of the addition requires a change in the present topography adjacent to the north side of the project. Thus, part of the proposed project includes landscaping the area between the building addition and Mars Road. This will not only assist in erosion control but also will create an inviting gateway to the Mars Site complex (Santos, 1988).

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Figure 11. Mars Site: Typical View Looking Southeast

## SECTION VI

### CONCLUSIONS OF THE ENVIRONMENTAL ASSESSMENT CONCERNING THE CONSTRUCTION AND UTILIZATION OF A 6,480-FT<sup>2</sup> ADDITION TO BUILDING G-86 AT THE MARS SITE

The Environmental Assessment (EA) for the 6,480-ft<sup>2</sup> building addition proposed to be constructed at the Mars Site at the GDSCC has examined the full range of potential environmental impacts that may result from the implementation of this project. The conclusion of this EA is that the proposed building addition and its utilization would not result in significant adverse impacts to the human or natural environment.

Thus, in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality implementing regulations and the NASA implementing provisions, the proposed project is eligible for a Finding of No Significant Impact (FONSI).

SECTION VII  
CERTIFICATION

I hereby certify that all work performed by M. B. Gilbert Associates, Long Beach, California, in its environmental assessment of the construction and utilization of a building addition proposed for the Mars Site at the Goldstone Complex of the Fort Irwin Military Reservation, San Bernardino County, California, as described in this report, was performed in compliance with Federal, state, and local regulations, and in accordance with good engineering and investigative practice.

Leonard H. Kushner  
Registered Professional Engineer

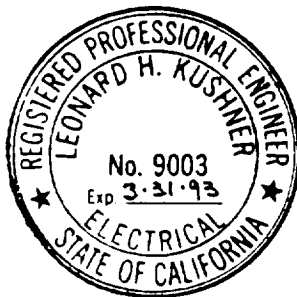
Signature Leon Kushner

Date Signed February 15, 1990

Registration No. E9003 Electrical  
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State: California  
California  
California

Stamp/Seal





APPENDIX A

FORT IRWIN ARCHEOLOGICAL AND ENVIRONMENTAL APPROVAL FOR THE PROPOSED  
ADDITION TO BUILDING G-86 AT THE MARS SITE

M&I-BLDG. ENV  
03/30/89

TO: Distribution

FROM: B. A. Gaudian *BJ*-

SUBJECT: Environmental and Archeological approval for G-86 extension

Attached is a copy of the Ft. Irwin environmental and archeological compliance approval for the Mars site G-86 54-foot building extension.

cc: H. Alderson  
L. E. Butcher  
P. Glenn  
L. Kushner  
J. E. McPartland  
G. H. Vollmer



APPENDIX B

INDIVIDUALS AND AGENCIES CONSULTED AND CONTACTED IN PREPARATION OF  
THE ENVIRONMENTAL ASSESSMENT

APPENDIX B

INDIVIDUALS AND AGENCIES CONSULTED IN PREPARATION OF THE ENVIRONMENTAL  
ASSESSMENT

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APPENDIX C

ENVIRONMENTAL ASSESSMENT: BIBLIOGRAPHY

## APPENDIX C

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15. Supplementary Notes					
16. Abstract <p>This report is an Environmental Assessment of the proposed addition to building G-86 at the Mars Site, which will provide space for new electronic equipment to consolidate the DSN support facilities from other GDSOC sites at the Mars Site, and will include a fifth telemetry and command group with its associated link monitor, control processor, and operator consoles. The addition of these facilities will increase the capability of the DSN to support future sophisticated NASA spacecraft missions such as the International Solar and Terrestrial Physics (ISTP) Program.</p> <p>The planned construction of this building addition requires an Environmental Assessment (EA) document that records the existing environmental conditions at the Mars Site, that analyzes the environmental effects that possibly could be expected from the construction and use of the new building addition, and that recommends measures to be taken to mitigate any possibly deleterious environmental effects.</p> <p>This present report is an expanded JPL-version of the EA document submitted to JPL by M. B. Gilbert Associates in May 1989. The conclusion of the MBGA-prepared environmental assessment is that there would be no significant adverse effects on the environment due to the construction and use of the proposed new building addition at the Mars Site.</p>					
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